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AUTOMATIONWORX

User Manual

UM EN FL BLUETOOTH AP

Order No.: 2888767

FL BLUETOOTH AP

AUTOMATIONWORX

User Manual
Hardware and Software of Bluetooth Access Points
- FL BLUETOOTH AP

07/2006

Designation: UM EN FL BLUETOOTH AP

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This user manual is valid for:

FL BLUETOOTH AP

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1 FL BLUETOOTH AP

1.1 Properties

The FL **B**LUE**T**OOTH **AP** (**BTAP**) is a Bluetooth access point, which is suitable for industrial use. The BTAP supports **Bluetooth specification 2.0** and has an RJ45 port with 10/100 Mbps with auto negotiation and a Bluetooth radio interface.

Figure 1-1 Front view of the BTAP

1.1.1 Device Properties

– Secure data transmission using 128-bit encryption.
– Support of LAN, PAN, and SPP Bluetooth profiles.
– Time delay through the radio path less than 15 ms (typical - for a PROFINET frame point-to-point)
– Configurable range of 0.1 m to 250 m outdoors.

The range can be clearly exceeded or underattained and depends on the environment and the antenna technology used.

– Roaming of an Ethernet client between several Bluetooth access points supported.
– Diagnostics of the radio path link quality.
– Automatic regulation of the transmission power.

1.1.2 Features and Fields of Application of the BTAP

– Reliable transmission of Ethernet data in harsh industrial environments.
– Parallel operation of multiple radio cells.
– Cyclic data transmission of low volumes of data.
– Operation of up to seven clients at a single access point.
– Mobile operation and monitoring.
– Communication between control systems with low volumes of data via Bluetooth.
– I/O data traffic with PROFINET IO systems via Bluetooth.
– Simultaneous transmission of several serial connections via Bluetooth.

1.2 Supported Bluetooth Profiles

Personal Area Networking (PAN)

– Transparent tunneling of Ethernet Layer 2 protocols.
– Maximum of seven simultaneous connections supported.
– The FL BLUETOOTH AP can be operated as an access point as well as a client.

The PAN profile defines ad hoc networking without servers between two to eight devices. One wired access point (NAP - Network Access Point) provides access to the Ethernet LAN for up to seven clients (PANU - PAN User). For additional information about using the PAN profile, please refer to "Personal Area Networking (PAN)" on page 3-8.

LAN Access Profile (LAP)

– PPP connection between the access point and a mobile termination device.
– Only Layer 3 IP traffic via Bluetooth permitted.

The LAP profile networks devices using TCP/IP not only within local networks, but also enables access to other networks. LAP uses the Point-to-Point Protocol (PPP) for authentication, which always requires a server (BTAP). For additional information about using the LAP profile, please refer to "LAN Access Profile (LAP)" on page 3-8.

Serial Port Profile (SPP)

– COM server function for converting serial data packed into Ethernet frames to the serial Bluetooth profile.

The SPP profile emulates a serial interface, which is used by other applications that were originally designed for communication via V.24 (RS-232). For additional information about using the SPP profile, please refer to "Serial Port Profile (SPP)" on page 3-9.

1.3 Approvals for Countries

The FL BLUETOOTH AP is a Bluetooth access point that is used to create radio cells. The device uses the international toll and license-free Bluetooth standard, which operates in the 2.4 GHz ISM band. This enables global use.

The device meets all the requirements of R&TTE directive 1999/5/EC (Europe):

– EMC according to EN 61000-6-2:2001
– Safety according to EN 60950:2001
– Health according to the recommendations of Gazette 1999/519/EC
– Radio according to ETSI EN 300328; V1.2.1, V1.4.1

The following additional approvals have also been performed and passed:

– FCC/CFR 47, Part 15 (USA)
– RSS 210 (Canada)

Depending on the maximum possible transmission power, the operation of this device must be approved or notified in some countries. In addition, usage restrictions may apply for the transmission power for indoor or outdoor use.

The FL BLUETOOTH AP has a maximum transmission power of 100 mW (20 dBm) and corresponds to R&TTE device class 2. At the time of going to print, the operation of this device had been approved/notified for the following countries (please observe the corresponding usage restrictions):

– Austria	20 dBm	– Great Britain	20 dBm	– Norway	20 dBm
– Belgium	20 dBm	– Greece	20 dBm	– Poland	20 dBm
– Canada	20 dBm	– Hungary	20 dBm	– Portugal	20 dBm
– Cyprus	20 dBm	– Iceland	20 dBm	– Slovakia	20 dBm
– Czech Republic	20 dBm	– Ireland	20 dBm	– Slovenia	20 dBm
– Denmark	20 dBm	– Italy *	10 dBm	– Spain	20 dBm
– Estonia	20 dBm	– Latvia	20 dBm	– Sweden	20 dBm
– Finland	20 dBm	– Lithuania	20 dBm	– Switzerland	20 dBm
– France *	10 dBm	– Luxembourg	20 dBm	– The Netherlands	20 dBm
– Germany	20 dBm	– Malta	20 dBm	– USA	20 dBm

Approvals for other countries are available on request.

*** Usage restrictions:**

France:
A maximum transmission power of 10 mW (10 dBm) is permitted outside buildings. Web-based management should be used to adapt the transmission power with the inclusion of the antenna data.

Italy:
A license is required to use the device outside buildings. A maximum transmission power of 10 mW (10 dBm) is permitted. Web-based management should be used to adapt the transmission power with the inclusion of the antenna data.

1.4 Mounting the BTAP

A minimum distance of 50 cm between modules must be observed when mounting the BTAPs.

1.4.1 Mounting the BTAP on a Flat Surface

Mount the BTAP on a flat mounting surface and secure the BTAP with two screws (e.g., with 84-M3 X 25-8.8 pan head screws). For the required drill hole spacing, refer to Figure 1-2 on page 1-4.

If the BTAP is assembled in a control cabinet, the antenna must be led outside. For a list of possible applications, calculation example, and corresponding accessories, please refer to "Antenna Accessories" on page 4-3.

1.4.1.1 Drill Hole Template and Housing Dimensions

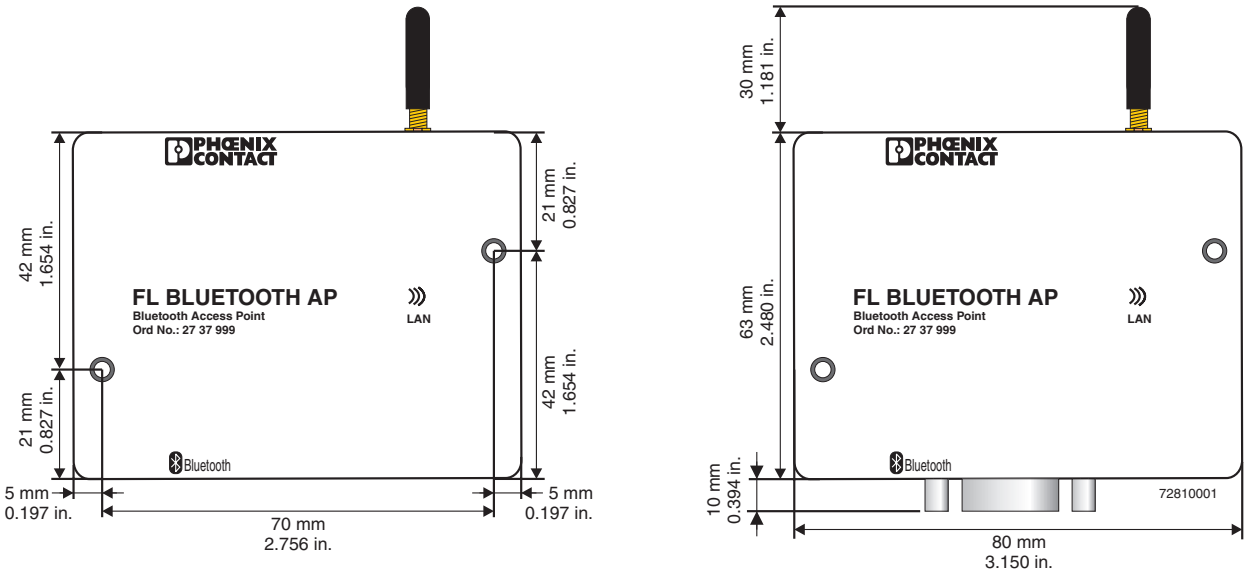


Figure 1-2 Housing dimensions and drill hole template for the BTAP in millimeters (inches)

1.4.2 DIN Rail Mounting/Removal of the BTAP

Mount the DIN rail adapter provided on the back of the BTAP. Make sure the adapter and BTAP are positioned correctly (see diagram below). To mount, place the upper holding keyway of the adapter on the top edge of the DIN rail and push onto the housing from above (A). Now push the bottom edge of the housing towards the DIN rail until the adapter snaps onto the DIN rail (B).

To remove, push on the housing from above (A) and pull the bottom edge away from the DIN rail (B).

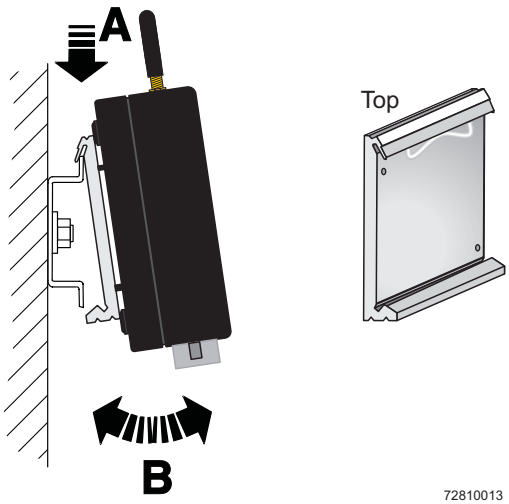


Figure 1-3 DIN rail mounting

A minimum distance of 50 cm between modules must be observed when mounting the BTAPs.

If the BTAP is assembled in a control cabinet, the antenna must be led outside. For a list of possible applications, calculation example, and corresponding accessories, please refer to "Antenna Accessories" on page 4-3.

1.5 Installation/Interfaces of the FL BLUETOOTH AP

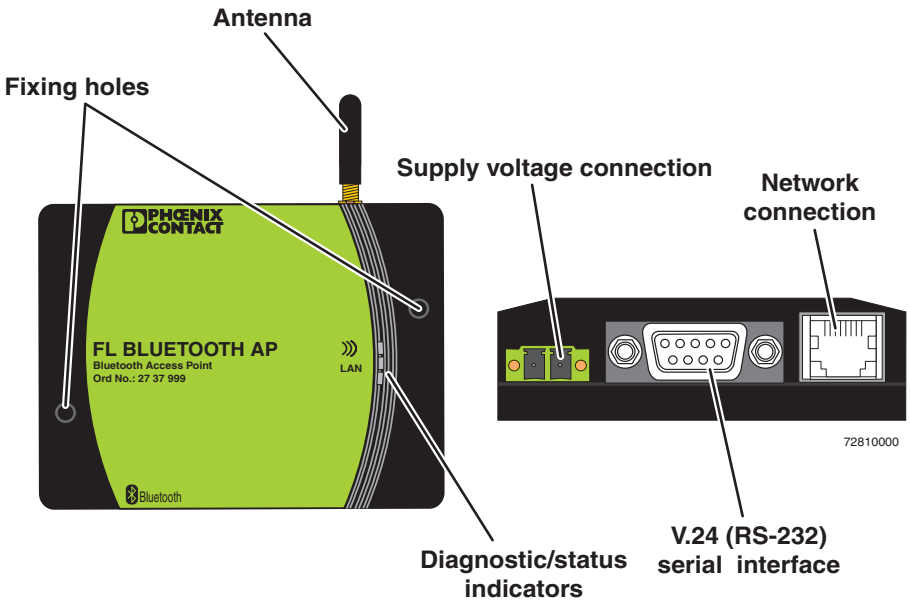


Figure 1-4 View/interfaces of the BTAP

– Fixing holes
  These holes can be used to fix the BTAP onto a flat mounting surface with two screws (e.g., with 84-M3 X 25-8.8 pan head screws) (for drill hole spacing see Figure 1-2 on page 1-4).
– Antenna
  The device is supplied with a 0 dB omni-directional antenna. The supplied antenna can be replaced with another antenna in accordance with the relevant national regulations.
– Supply voltage connection
  The supply voltage is connected via the 2-pos. COMBICON connector.
– Network connection
  Copper interface in RJ45 format with 10/100 Mbps with auto negotiation.
– V.24 (RS-232) serial interface
  V.24 (RS-232) interface in (9-pos.) D-SUB format - no function at present.
– Status and diagnostic indicators
  The LEDs indicate the status of the Ethernet and Bluetooth interfaces.

1.5.1 Connecting the Supply Voltage

24 V DC

The BTAP is operated with a 24 V DC voltage.

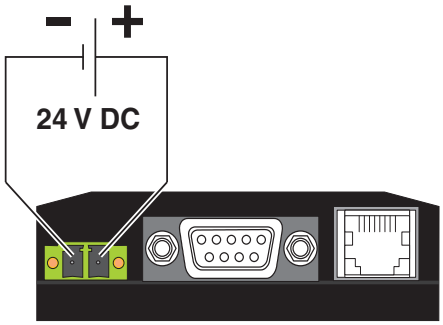


Figure 1-5 Supply to the BTAP

1.5.2 Status and Diagnostic Indicators

Three LEDs are located on the front of the device, which indicate various states.

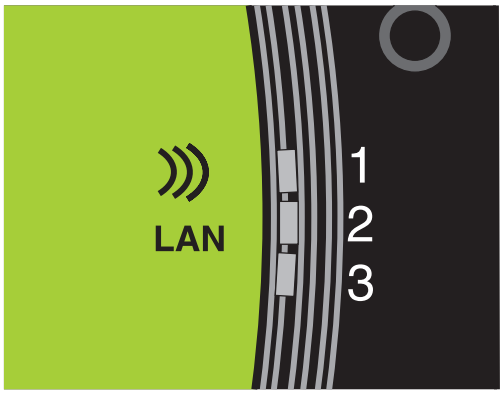


Figure 1-6 LEDs on the front of the device

Des.	Color	Status	Meaning
))) (LED 1)	Blue/ green	Green ON	The device was successfully started and is ready to operate
		Green and blue flashing	Attempting to establish a connection to another Bluetooth device
		Blue ON	A Bluetooth connection has been established
		Blue flashing	Transmitting data
		Three green and one blue flashing signal	Configuration modified, the device is waiting to be reset
		Green flashing	The device is in the error state
LAN (LED 2)	Yellow/ green	ON (green)	Ethernet link present
		ON (yellow)	Ethernet communication active
		OFF	No Ethernet connection
LED 3	No function		

1.5.3 Assignment of Ethernet Cables

To connect the BTAP to an infrastructure component (e.g., switch), a 1:1 cable or line cable is required.

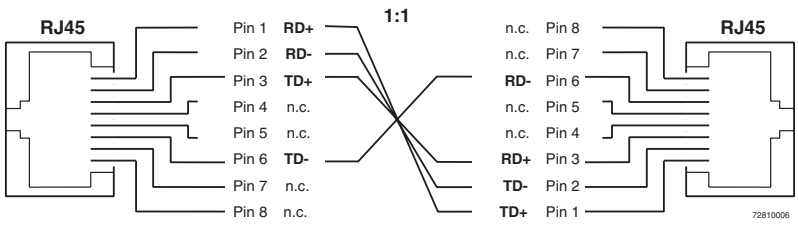


Figure 1-7 Assignment of a 1:1 network cable

To connect the BTAP to a termination device (e.g., computer), a crossover cable is required.

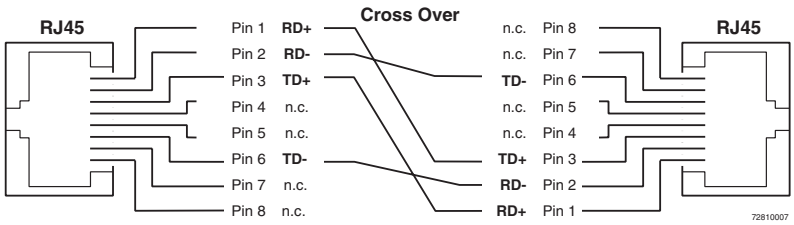


Figure 1-8 Assignment of a crossover cable

1.5.4 V.24 (RS-232) Interface

The V.24 (RS-232) interface does not have a function at present.

2 Technical Description

2.1 Adaptive Frequency Hopping

In order to achieve a high level of reliability during data transmission, the BTAP uses adaptive frequency hopping. Data transmission with adaptive frequency hopping takes place over the entire 2.4 GHz frequency band, where the 79 hopping channels change up to 1600 times per second. If a channel is used or disturbed by another radio signal, the channel is removed from the hopping sequence. This ensures that neither the Bluetooth signal to be transmitted, nor the other radio service is disturbed. In addition to frequency hopping, other properties ensure rugged wireless transmission:

– High receiver sensitivity
– Very short data telegrams
– Error correction mechanisms
– Repetition in the event of transmission errors

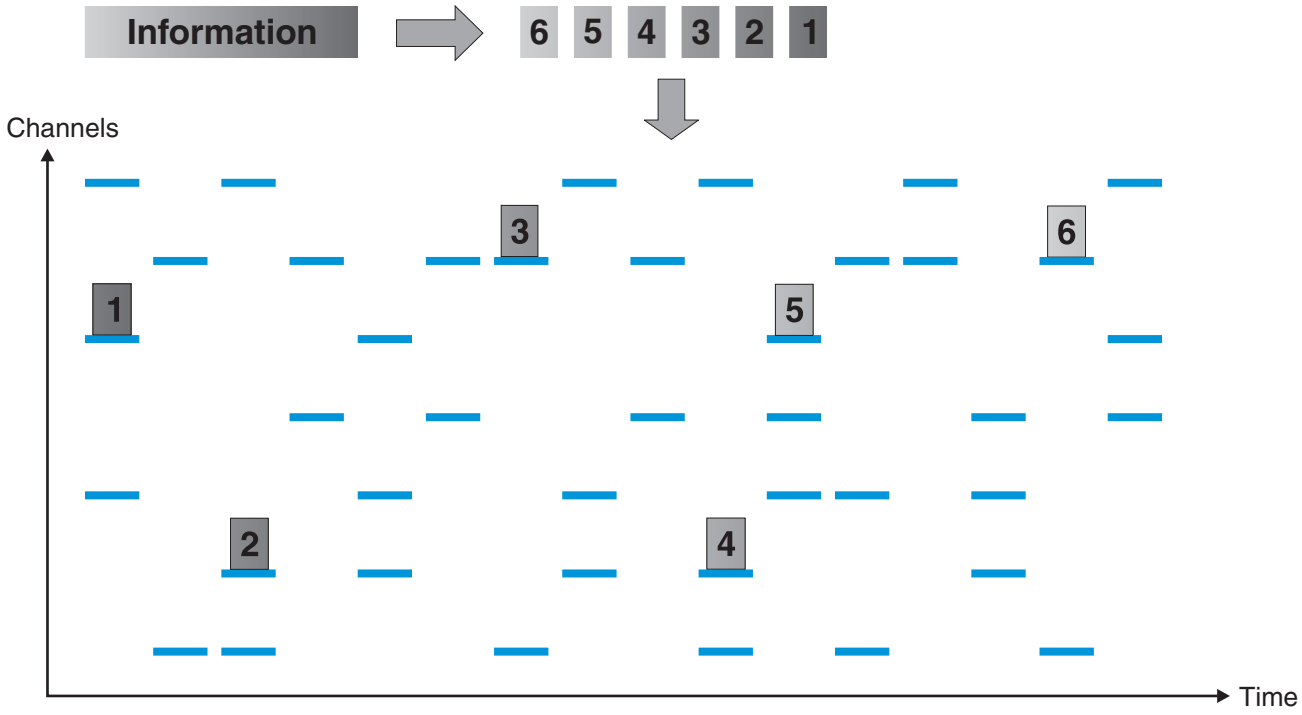


Figure 2-1 Principle of data transmission

3 Startup and Configuration

3.1 Default Upon Delivery/Default Settings

By default upon delivery or after the system is reset to the default settings, the following functions and properties are available:

– The user name for WBM is "admin", the password is "admin".
– The Bluetooth PIN number is "32825".
– The BTAP is supplied with the following IP parameters:
  IP address: 10.0.0.100
  Subnet mask: 255.255.255.0
  Gateway: 0.0.0.0
– DHCP is activated as the addressing mechanism.

3.2 Initial Startup

When the devices are started for the first time individually (i.e., without radio contact with another Bluetooth device) with default settings, the automatic pairing function is activated and "PhoenixAccessPoint" appears in the "PAN remote peers" field.

If the second device (also with default settings) is then switched on, the devices connect to one another and form a transparent Ethernet connection.

Following successful connection establishment, the automatic pairing function is switched off for both devices. On one of the devices, the entry in the "PAN remote peers" field is deleted, leaving the field empty. On the other device, the "PAN remote peers" field contains the MAC address of the first device.

3.2.1 Reset to Activate the Configuration Settings

The configuration settings are only applied when the Reset button is pressed. Please note that all modified settings will be overwritten.

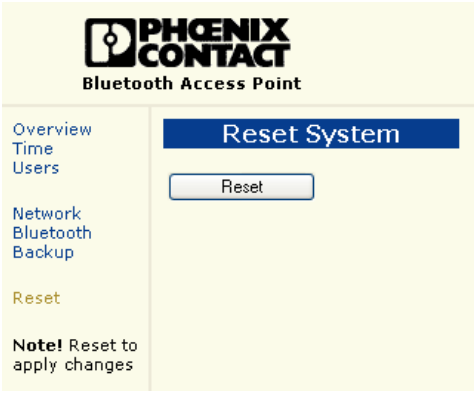


Figure 3-1 "Reset" in WBM

3.3 Making Contact for Initial Configuration

3.3.1 Operation With DHCP Server

If there is a DHCP server in your network, it automatically assigns an IP configuration to the BTAP following startup. WBM can be accessed via the IP address assigned by the DHCP server. The device can be connected to the DHCP server via the Ethernet port, but also via a Bluetooth connection.

3.3.2 Operation With Static IP Addresses

The devices are supplied with fixed IP parameters. If no DHCP server is available in your network, the BTAP starts with a fixed IP address. In this case, for initial contact your computer must be configured so that contact is possible. The following screenshots were created under Windows XP Professional.

To set the IP parameters, open the Properties tab for your network adapter. Activate "Internet Protocol (TCP/IP)" and then click on "Properties".

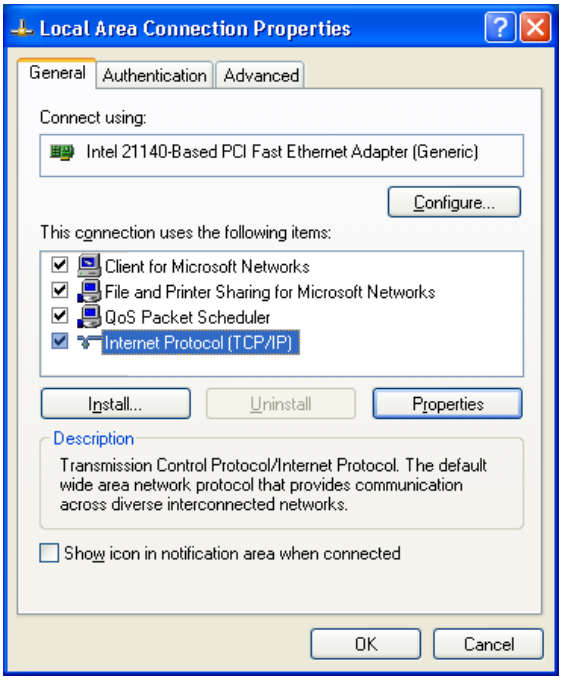


Figure 3-2 Properties dialog box for the network card

In the dialog box that opens, click on "Use the following IP address".

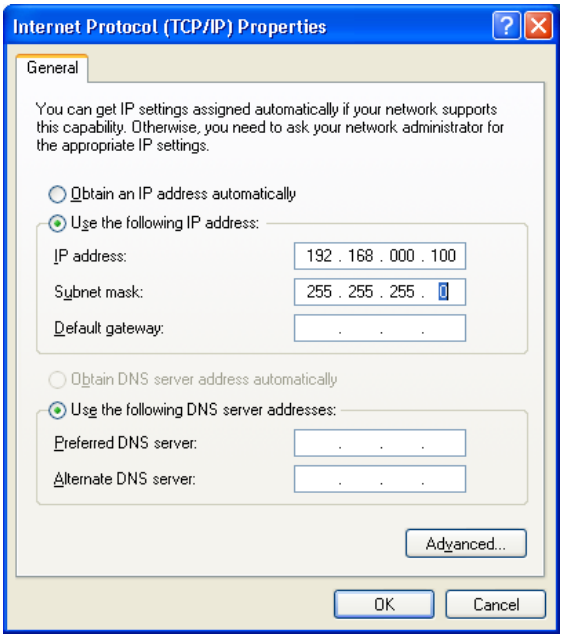

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 000 . 100
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Figure 3-3 Internet Protocol Properties dialog box

Enter the desired IP address in the "IP address" field. The first three bytes of the address must be "10.0.0.". The last byte must contain a number between 1 and 254, but not 100, the value "1" is selected in the example. See also 3.3.3 "Assigning IP Parameters".

"255.255.255.0" must be set as the subnet mask, close the dialog boxes with "OK".

The device can now be accessed via a web browser. Enter the following address in the address line:

http://10.0.0.100

The user name and password only have to be entered on configuration pages where the device settings can be modified. After entering the IP address in the browser, an overview page is displayed for the BTAP where no login is required.

After the correct user name and password have been entered the device configuration pages are loaded.

3.3.3 Assigning IP Parameters

When the supply voltage is switched on, the BTAP sends requests to the DHCP server to assign IP parameters. If **no** DHCP server is available in the network, the BTAP uses the **fixed** IP address (10.0.0.100) set by default upon delivery.

The "DHCP" function can be deactivated via the management. By default upon delivery, the "DHCP" function is activated.

The assignment of valid IP parameters is vital to the operation of the BTAP.

Options for Assigning IP Parameters:

– Configuration via the DHCP protocol (default upon delivery)
– Static configuration via the management interfaces

3.3.3.1 Valid IP Parameters

IP parameters comprise the following three elements: "IP address", "subnet mask", and "default gateway/router".

Valid IP addresses are:
000.000.000.001 to 126.255.255.255
128.000.000.000 to 223.255.255.255

Valid multicast addresses are:
224.000.000.001 to 239.255.255.255

Valid subnet masks are:
255.000.000.000 to 255.255.255.252

Default gateway/router:
The IP address of the gateway/router must be in the same subnetwork as the address of the switch.

3.3.3.2 Assigning IP Addresses

The IP address is a 32-bit address, which consists of a network part and a user part. The network part consists of the network class and the network address.
There are currently five defined network classes; Classes A, B, and C are used in modern applications, while Classes D and E are hardly ever used. It is therefore usually sufficient if a network device only "recognizes" Classes A, B, and C.

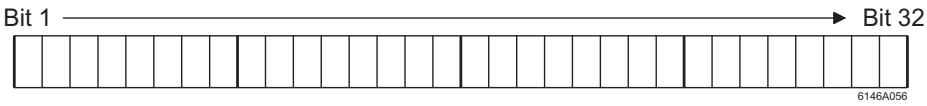


Figure 3-4 Position of bits within the IP address

With binary representation of the IP address the network class is represented by the first bits. The key factor is the number of "ones" before the first "zero". The assignment of classes is shown in the following table. The empty cells in the table are not relevant to the network class and are already used for the network address.

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5
Class A	0				
Class B	1	0			
Class C	1	1	0		
Class D	1	1	1	0	
Class E	1	1	1	1	0

The bits for the network class are followed by those for the network address and the user address. Depending on the network class, a different number of bits are available, both for the network address (network ID) and the user address (host ID).

	Network ID	Host ID
Class A	7 bits	24 bits
Class B	14 bits	16 bits
Class C	21 bits	8 bits
Class D	28-bit multicast identifier	
Class E	27 bits (reserved)	

IP addresses can be represented in decimal or hexadecimal form. In decimal notation, bytes are separated by dots (dotted decimal notation) to show the logical grouping of the individual bytes.

The decimal points do not divide the address into a network and user address. Only the value of the first bits (before the first "zero") specifies the network class and the number of remaining bits in the address.

Possible Address Combinations

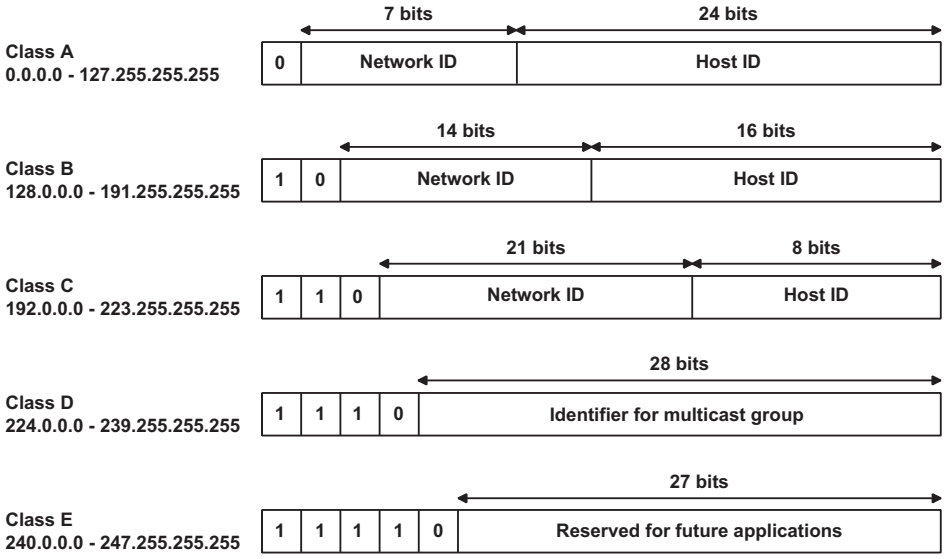


Figure 3-5 Structure of IP addresses

3.3.3.3 Special IP Addresses for Special Applications

Certain IP addresses are reserved for special functions. The following addresses should not be used as standard IP addresses.

127.x.x.x Addresses

The Class A network address "127" is reserved for a loopback function on all computers, regardless of the network class. This loopback function may only be used on networked computers for internal test purposes.

If a telegram is addressed to a computer with the value 127 in the first byte, the receiver immediately sends the telegram back to the transmitter.

The correct installation and configuration of the TCP/IP software, for example, can be checked in this way.

As Layers 1 and 2 of the ISO/OSI reference model are not included in the test they should be tested separately using the ping function.

Value 255 in the Byte

Value 255 is defined as a broadcast address. The telegram is sent to all the computers that are in the same part of the network. Examples: 004.255.255.255, 198.2.7.255 or 255.255.255.255 (all the computers in all the networks). If the network is divided into subnetworks, the subnet masks must be observed during calculation, otherwise some devices may be omitted. Simplified: The last address of an area is reserved as the broadcast address.

0.x.x.x Addresses

Value 0 is the ID of the specific network. If the IP address starts with a zero, the receiver is in the same network. Example: 0.2.1.1 refers to device 2.1.1 in this network.

The zero previously signified the broadcast address. If older devices are used, unauthorized broadcast and complete overload of the entire network (broadcast storm) may occur when using the IP address 0.x.x.x.

3.3.3.4 Subnet Masks

Routers and gateways divide large networks into several subnetworks. The IP addresses for individual devices are assigned to specific subnetworks by the subnet mask. The **network part** of an IP address is **not** modified by the subnet mask. An extended IP address is generated from the user address and subnet mask. Because the masked subnetwork is only recognized by the local computers, this extended IP address appears as a standard IP address to all the other devices.

Structure of the Subnet Mask

The subnet mask always contains the same number of bits as an IP address. The subnet mask has the same number of bits (in the same position) set to "one", which is reflected in the IP address for the network class.

Example: An IP address from Class A contains a 1-byte network address and a 3-byte computer address. Therefore, the first byte of the subnet mask may only contain "ones".

The remaining bits (three bytes) then contain the address of the subnetwork and the computer. The extended IP address is created when the bits of the IP address and the bits of the subnet mask are ANDed. Because the subnetwork is only recognized by local devices, the corresponding IP address appears as a "normal" IP address to all the other devices.

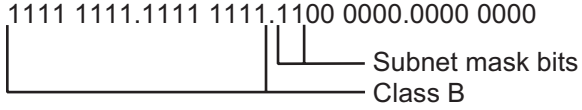
Application

If the ANDing of the address bits gives the local network address and the local subnetwork address, the device is located in the local network. If the ANDing gives a different result, the data telegram is sent to the subnetwork router.

Example for a Class B subnet mask:

Decimal representation: 255.255.192.0

Binary representation: 1111 1111.1111 1111.1100 0000.0000 0000



Using this subnet mask, the TCP/IP protocol software differentiates between the devices that are connected to the local subnetwork and the devices that are located in other subnetworks.

Example: Device 1 wants to establish a connection with device 2 using the above subnet mask. Device 2 has IP address 59.EA.55.32.

IP address display for device 2:

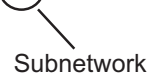
Hexadecimal representation: 59.EA.55.32

Binary representation: 0101 1001.1110 1010.0101 0101.0011 0010

The individual subnet mask and the IP address for device 2 are then ANDed bit-by-bit by the software to determine whether device 2 is located in the local subnetwork.

ANDing the subnet mask and IP address for device 2:

Subnet mask:		1111 1111.1111 1111.1100 0000.0000 0000
	AND	
IP address:		0101 1001.1110 1010.0101 0101.0011 0010
Result:		0101 1001.1110 1010.0100 0000.0000 0000



After ANDing, the software determines that the relevant subnetwork (01) does not correspond to the local subnetwork (11) and the data telegram is forwarded to a subnetwork router.

3.3.4 Supported Bluetooth Profiles

3.3.4.1 Personal Area Networking (PAN)

The Bluetooth profile can be used to create wireless networks whose devices are located at close range.

– Transparent tunneling of Ethernet Layer 2 protocols.
– Maximum of seven simultaneous connections supported.
– The FL BLUETOOTH AP can be operated as an access point as well as a client.

The PAN profile defines ad hoc networking without servers between two to eight devices. One wired access point (NAP) provides access to the Ethernet LAN for up to seven clients (PANUs). An NAP can be connected to up to seven PANUs. A PANU can establish one connection either to an NAP or to another PANU.

3.3.4.2 LAN Access Profile (LAP)

The LAP Bluetooth profile enables Bluetooth devices to access local networks.

– PPP connection between the access point and a mobile termination device.
– Only Layer 3 IP traffic via Bluetooth permitted.

The LAP profile networks devices using TCP/IP not only within local networks, but also enables access to other networks. LAP uses the Point-to-Point Protocol (PPP) for authentication, which always requires a server.

3.3.4.3 Serial Port Profile (SPP)

The SPP Bluetooth profile can be used to establish a serial connection between two Bluetooth devices. The serial port is emulated according to the RFCOMM Bluetooth protocol.

– COM server function for converting serial data packed into Ethernet frames to the serial Bluetooth profile.

The SPP profile emulates a serial interface, which is used by other applications that were originally designed for communication via V.24 (RS-232).

3.4 Web-Based Management (WBM)

The pages in WBM contain static information (e.g., the device type) as well as dynamic information, such as the time or status information.

3.4.1 Starting WBM

To start WBM for the BTAP, enter the currently valid IP address in the address line of your browser in the following format: http://10.0.0.100 (default).
If the BTAP is connected correctly and the addresses for the PC and BTAP are in the same area, the following window is displayed:

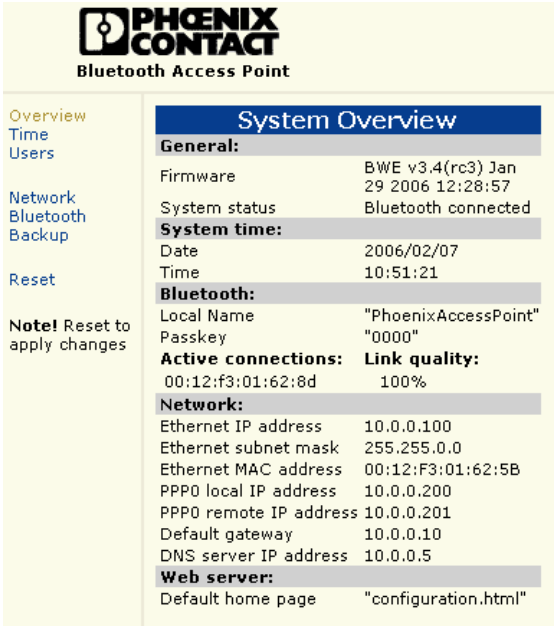


Figure 3-6 Start window display

WBM is divided into the following functional groups:

– Overview
– Time
– User (password required)

– Network (password required)
– Bluetooth (password required)
– Backup (password required)
– Reset (password required)

Their subgroups are illustrated in the figure below.

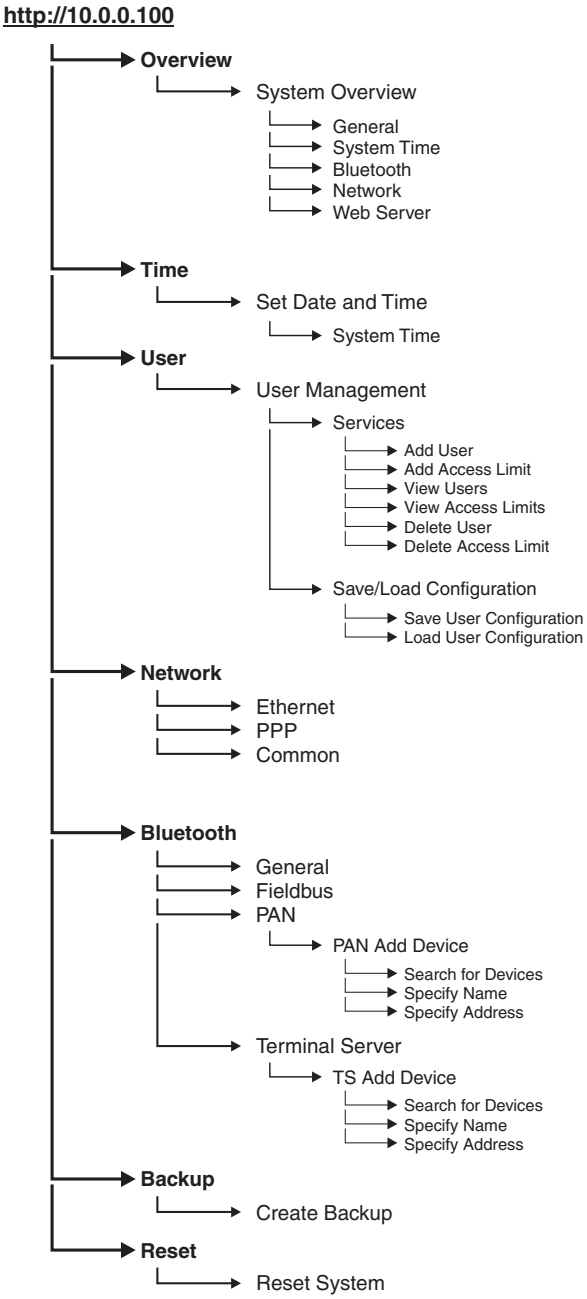


Figure 3-7 Structure of WBM

3.4.2 Password Protection for WBM

In each session, when clicking for the first time on a menu item that requires a password, the following window appears:

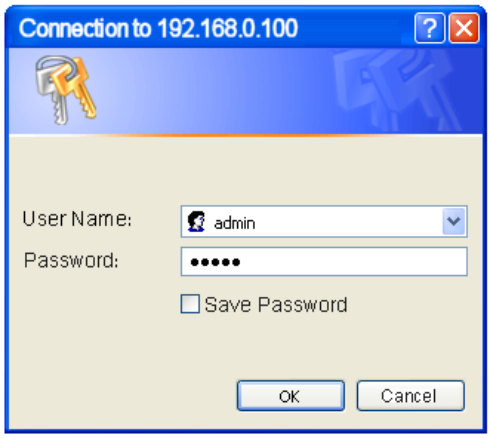


Figure 3-8 Access point or client login page

By default upon delivery use the following settings to log in:

User name: **admin**

Password: **admin**

3.4.2.1 "Overview" menu

The "Overview" page contains a wide range of information, which is divided into five areas:

– General
– System time
– Bluetooth
– Network
– Web server

General The device firmware ID, including the creation date, and the device status are listed under "General".

System time The values set by the user for the time and date are listed under "System time".

Bluetooth The access point name and the currently valid password for establishing a Bluetooth connection are listed under "Bluetooth". In addition, connections that are currently active are displayed together with their signal quality.

Network The available parameters, such as MAC address, IP address, etc. are displayed under "Network".

Web server Indicates the homepage set for WBM.

3.4.2.2 "Time" Menu

The current system time is displayed here. To set another time, overwrite the fields in the specified format and confirm with "Set Date and Time".

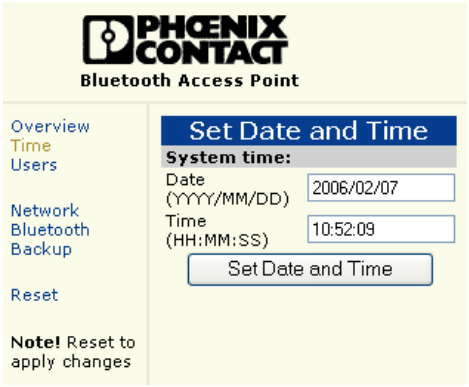


Figure 3-9 "Set Date and Time" menu

3.4.2.3 "User" Menu

In the "User" menu, various users can be created with different access rights. The access rights for each individual web page can be defined. Each user can be assigned an access level. Each web page can be assigned an access limit. To access a web page, the user's access level must be equal to or greater than the web page access limit.

An access limit of "5" is preset for all configuration pages, so that only users with the highest access level, i.e., level "5", can access the web pages.

If a page is assigned a lower access limit, users with a correspondingly lower level can also access the pages.

In addition, settings for the user-specific configuration file can be made here.

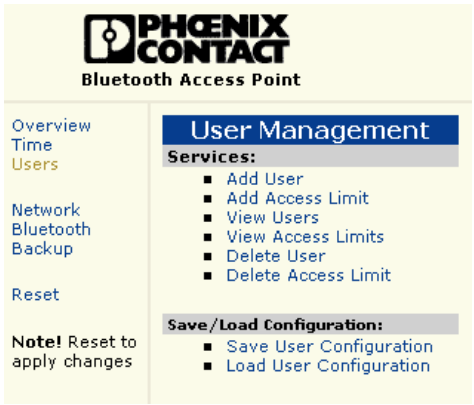


Figure 3-10 "User" menu

Add User

"Add User" can be used to add additional users. To do this, the user name and the individual password for the user are required. The access level is also set here.

Table 3-1 User rights depending on the access level

Access Level	User Rights
1	Level 1 rights (minimum access)
2	Level 1 and 2 rights
3	Level 1, 2, and 3 rights
4	Level 1, 2, 3, and 4 rights
5	Level 1, 2, 3, 4, and 5 rights (maximum access)

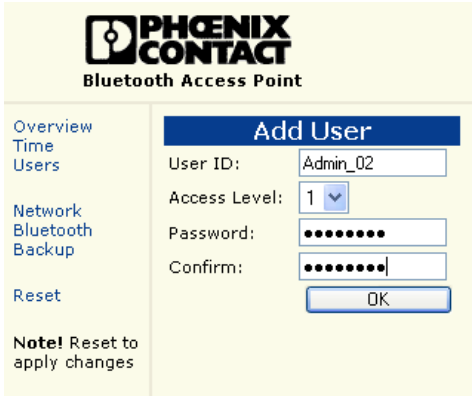


Figure 3-11 "Add User" menu

Add Limit

Access limits for each individual web page can be added under "Add Limit". To call the web page, the user's access level must be at least as high as the access limit. In addition, the access limit for the web page is set here.

Table 3-2 Required user rights depending on the access limit

Web Page Access Limit	User Rights Required to Call the Web Page
1	1, 2, 3, 4 or 5
2	2, 3, 4 or 5
3	3, 4 or 5
4	4 or 5
5	5

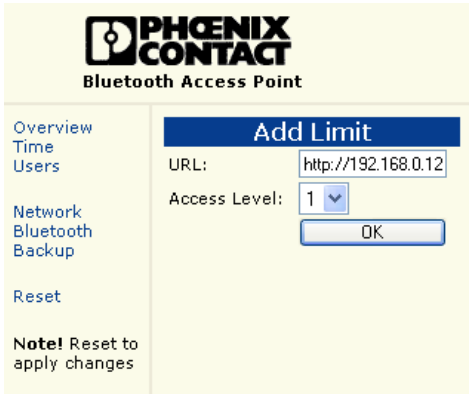


Figure 3-12 "Add Access Limit" menu

View Users

Under "View Users", all registered users can be viewed in list form together with their user name and corresponding access level.

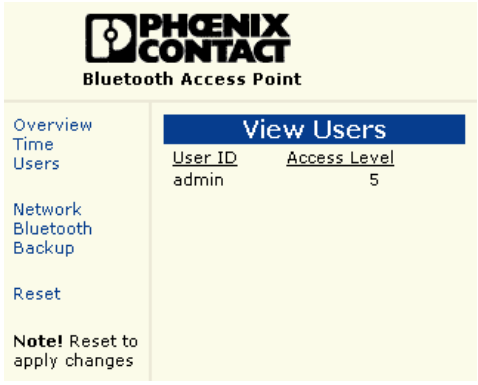


Figure 3-13 "View Users" menu

View (Access) Limits

A list of the access limits currently valid for the individual web pages is displayed here.

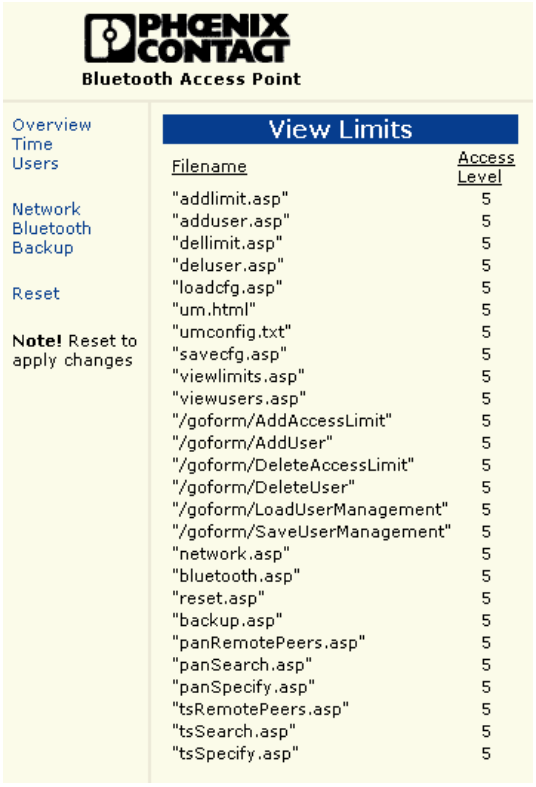


Figure 3-14 "View (Access) Limits" menu

Delete User

Existing users can be deleted here.

Do not delete all users. At least one user must always be registered.

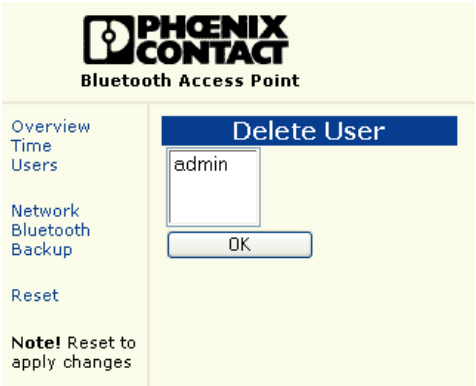


Figure 3-15 "Delete User" menu

Delete Access Limit In the "Delete Access Limit" menu, the access rights for web pages can be removed.

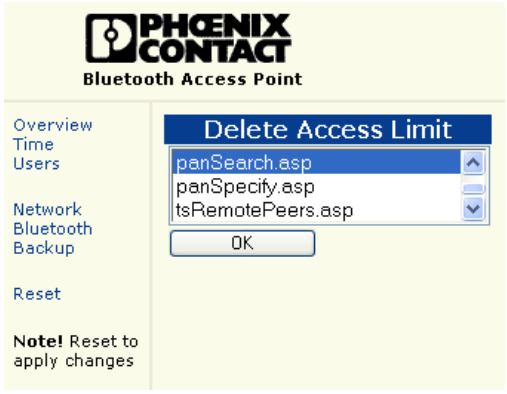


Figure 3-16 "Delete Access Limit" menu

"Save/Load Configuration" Menu

Save User Configuration In this menu, click on "Save" to save the user-specific settings or rights.

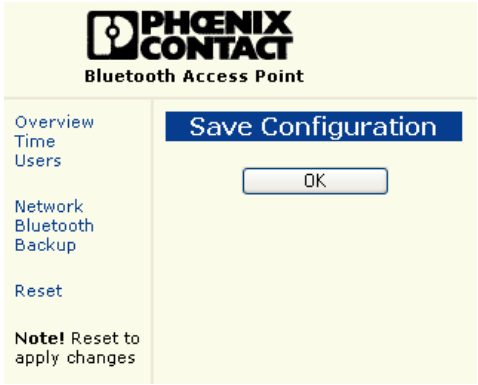


Figure 3-17 "Save (User) Configuration" menu

Load User Configuration A previously saved configuration can be loaded here.

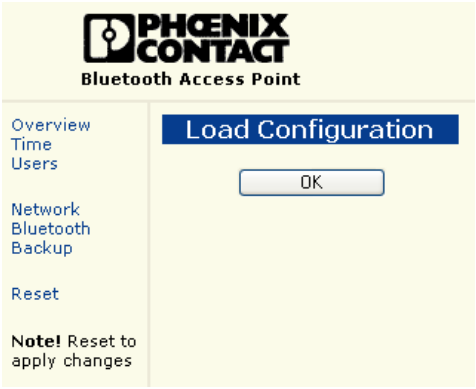


Figure 3-18 "Load Configuration" menu

3.4.2.4 "Network" Menu

In the "Network" menu, all settings are made, which affect the RJ45 Ethernet interface.

Network/Ethernet

The currently valid IP parameters are displayed in the "Ethernet" area. The IP address and subnet mask can be overwritten.

If the IP parameters are adjusted and saved with "Save", the BTAP can no longer be accessed from the moment that you click on "Reset". The device can be accessed using the new IP address.

Under "DHCP", address assignment via DHCP can be activated/deactivated.

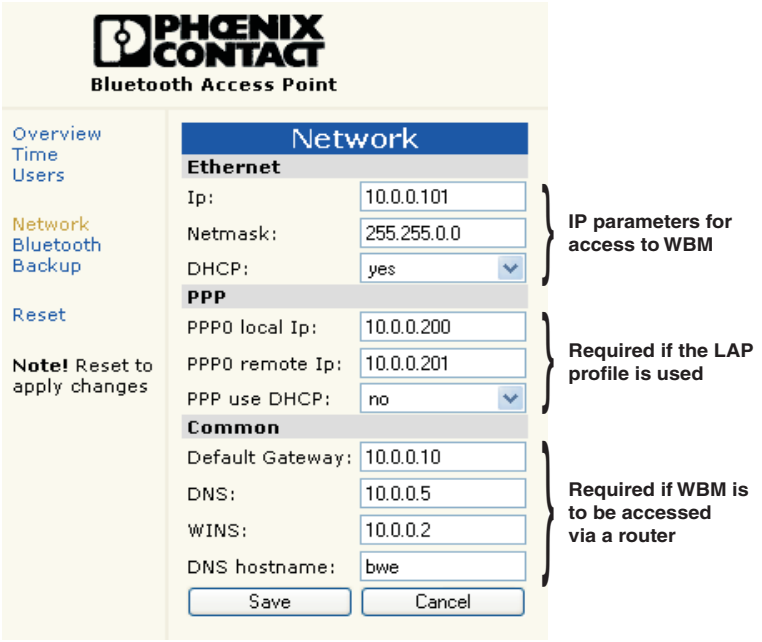


Figure 3-19 "Network" menu

Use of the LAP profile:

The LAP profile (Layer 3 transparent) uses a PPP connection between BTAP and the Bluetooth termination device, therefore only IP data traffic is possible.

PPPO local: IP address of the BTAP for the PPP/LAN connection.

PPPO remote: IP address of the termination device. This IP address is assigned to the termination device by the BTAP.

Use of the LAP profile:

When using the LAN profile, the BTAP acts as a proxy for the DNS requests from the connected Bluetooth termination device. So that these requests can be forwarded to the correct WINS or DNS server, the necessary settings must be made in the "Network" menu under "Common".

"PPP use DHCP" selection

A DHCP server can also be used to assign the PPP IP addresses. If the function is activated, the entries under "PPPO local" or "PPPO remote" are irrelevant if a DHCP server is available.

Common

Under "Common", the necessary entries are made if configuration via WBM is to be accessed using a router.

3.4.2.5 "Bluetooth" Menu

In the "Bluetooth" menu, all settings are made, which affect the Bluetooth interface.

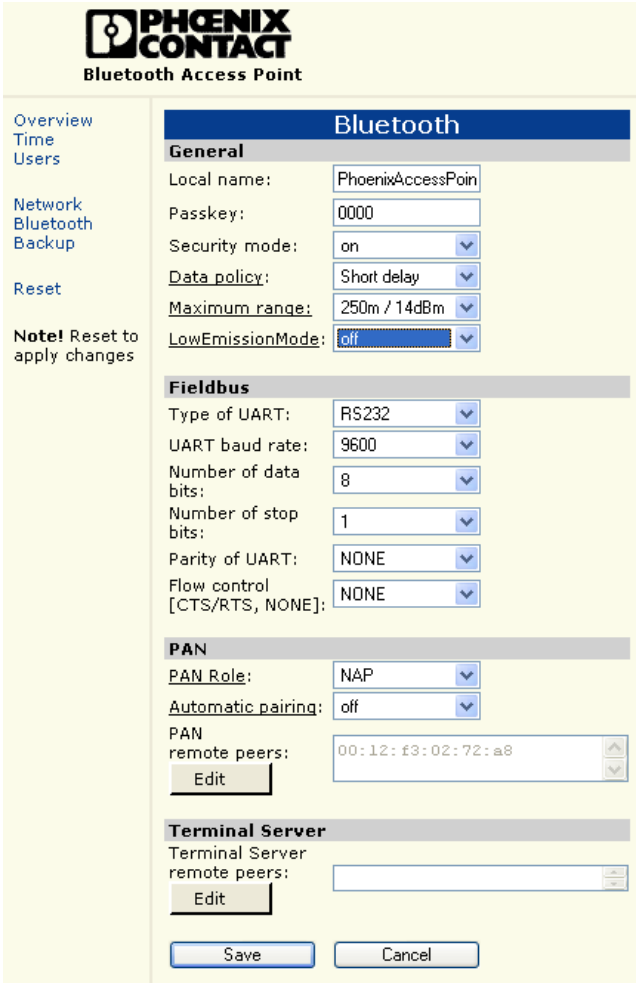


Figure 3-20 "Bluetooth" menu

Bluetooth/General

In the "General" menu, basic Bluetooth settings are made.

Local name: Bluetooth name of the BTAP. The "Local Name" can be used to configure a Bluetooth connection.

Passkey: Security key for encryption (alphanumeric entry supported). The passkey must be identical for devices that are to communicate with one another with security mode switched on.

Security Mode: Switches the security function on or off. When Security Mode is switched on, the highest level of Bluetooth encryption is selected, in addition the passkey is requested for pairing.

Data Policy: Here, the transmission type for data packets can be specified.

- Short Delay (default) with medium data throughput and short latency times (approximately 15 ms). For "Short Delay", the packet length for the BTAP data is specified as required when error correction is switched **on**. Possible packet lengths are 0 to 17 bytes, 0 to 27 bytes or 0 to 121 bytes.
- Increased Range - In this mode small packets are sent when error correction is switched **on**, so that in the event of a transmission error only a small volume of data has to be repeated.
- High Speed with high data throughput (up to 600 kbps unidirectional) and at higher latency times - The greatest data throughput is achieved in this mode. Packets with a length of 0 to 339 bytes are sent when error correction is switched **off**.

Setting the Transmission Power

Please note that for a radio unit, the **total** from the set transmission power and the antenna gain, minus the attenuation for cables, lines, and connectors **must not exceed the maximum country-specific value**.

For the maximum country-specific values, please refer to "Approvals for Countries" on page 1-3. For additional information, please refer to "Calculation for the Emitted Power" on page 4-4.

Maximum Range: Here the range/transmission power of the Bluetooth transmitter can be set in the following steps:

- 0.1 m/-50 dBm
- 1 m/-32 dBm
- 25 m/-5 dBm
- 50 m/1 dBm
- 100 m/6 dBm
- 250 m/14 dBm

Low Emission Mode: This mode should be switched on if other radio applications are operated in the same frequency range (e.g., WLAN, other BTAPs).

Bluetooth/Fieldbus

The settings under "Fieldbus" for the serial interface are not relevant at present, but can be used as follows.

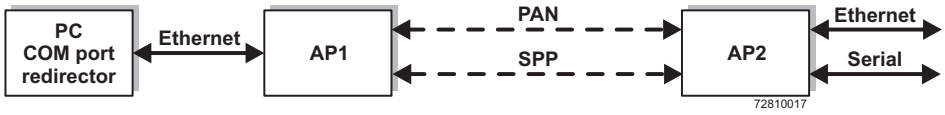


Figure 3-21 Principle for using the serial interface

Setting under AP1: Terminal server and entered as remote peer "AP2"

A PC with redirector software connected to AP1 can then control the serial port of AP2. The serial connection operates **parallel** to the PAN connection.

Bluetooth/PAN

Configuration for PAN (Personal Area Network), for any Ethernet communication (Layer 3 transparent).

PAN Role: Selection for the BTAP to operate as a client or as an access point.

Operation as an access point - "NAP" (Network Access Point) setting

Operation as a client - "PANU" (Personal Area Network User) setting

Automatic pairing - If this function is activated, the BTAP automatically pairs itself with another device that has the same "Local Name".

PAN Remote Peers

By clicking on "Edit", the connections that are to be established by the device can be configured. Three versions are supported:

– Entry of the Bluetooth MAC address for the device with which a connection is to be established.
– Entry of the "Local Name" for the device with which a connection is to be established.
– Click on "Search for Devices". The devices that can be accessed are displayed in list form and can then be selected.

Note on using "Local Names"/"Device Names"

A connection is established to a device whose "Local Name" **starts** with the character string entered, which thus enables a form of roaming. Example: The characters "AP" are configured in the PANU. Two access points are available with the names "AP1" and "AP2". The PANU connects to the first AP that can be accessed. If the connection is aborted, a search is performed automatically to find an alternative.

3.4.2.6 Additional Bluetooth Devices

All Bluetooth devices that can be accessed are displayed in the "PAN Add Devices" menu. By clicking in the checkbox, the device will be configured as a peer.

Figure 3-22 "PAN Add Devices" menu

Devices that can be accessed are listed with their "Device Address" and their "Device Name".

Bluetooth/Terminal Server

The BTAP contains a terminal server. Here, devices that have physical serial interfaces are configured. The port number indicates which serial data stream ("compressed" in TCP/IP) is forwarded to which Bluetooth devices.

Example: The settings listed in the table result in a serial connection being established from COM 3 (COM 4) on the PC via BTAP1 to Remote Device 1 (Remote Device 2).

Table 3-3 Typical terminal server settings

PC With Redirector	BTAP1 Connected to the PC	Remote Devices
COM 3: 192.168.0.100 port: 1000	BTAP1 terminal server	Remote Device 1: port number: 1000
COM 4: 192.168.0.100 port: 1001		Remote Device 2: port number: 1001

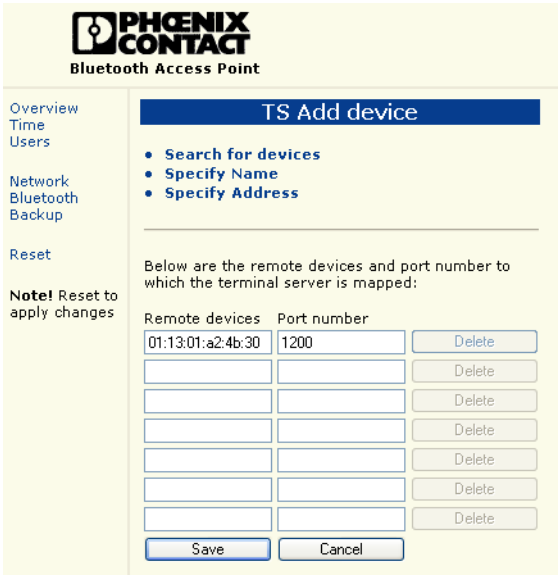


Figure 3-23 "Terminal Server" menu

3.4.2.7 "Backup" Menu

Backup

In the "Backup" menu you can choose whether a configuration file should be saved on an external drive or whether a configuration file should be loaded on the BTAP.

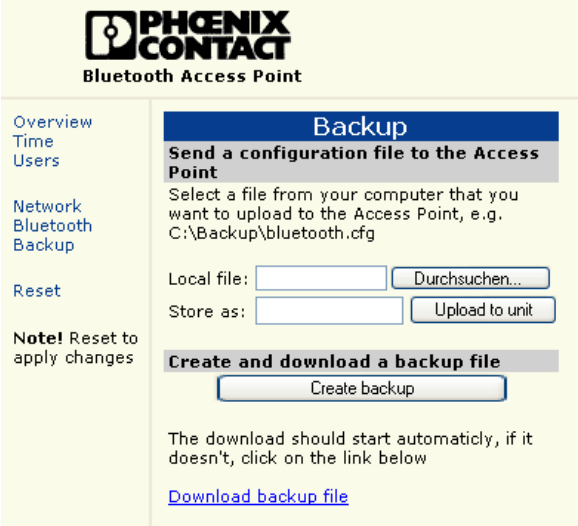


Figure 3-24 "Backup" menu

3.4.2.8 "Reset" Menu

In order to activate configuration modifications, click on "Reset".

Reset

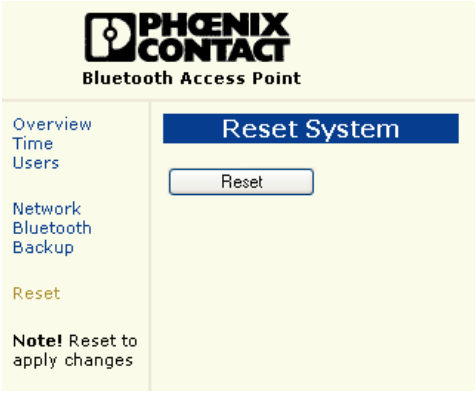


Figure 3-25 "Reset" menu

3.5 Firmware Update

The files for a firmware update can be transferred via FTP (File Transfer Protocol). To do this, an FTP server or browser such as Microsoft Internet Explorer 6.0, which also supports the File Transfer Protocol, is required. If using an FTP server, you must log into the BTAP as the administrator (admin). Internet Explorer 6.0 is used in this example.

3.5.1 Establishing the FTP Connection

To establish the FTP connection, enter the following characters in the browser address line (illustrated here with the currently valid IP address):
ftp://admin@192.168.0.54

The following window appears; the messages that are displayed are not relevant.

Anmelden als
Die Anmeldung an dem FTP-Server für diesen Benutzernamen und Kennwort konnte nicht durchgeführt werden.
FTP-Server: 192.168.0.54
Benutzername: admin
Kennwort:
Nach der Anmeldung können Sie diesen FTP-Server den Favoriten hinzufügen, um auf den Server zukünftig schneller zugreifen zu können.
Kennwörter oder Dateien werden durch FTP nicht verschlüsselt oder codiert, bevor sie an den Server gesendet werden. Verwenden Sie Webordner (WebDAV), um Kennwörter und Daten zu schützen.
Weitere Informationen über Webordner verwenden.
Anonym anmelden
Kennwort speichern
Anmelden
Abbrechen

Figure 3-26 FTP login

The IP address of your BTAP is displayed under "FTP Server". Under "User name" (Benutzername), enter **"admin"** if it does not appear automatically. After entering the correct password, the contents of the BTAP memory are displayed.

The **password required** for the update is **supplied** with the firmware version update.

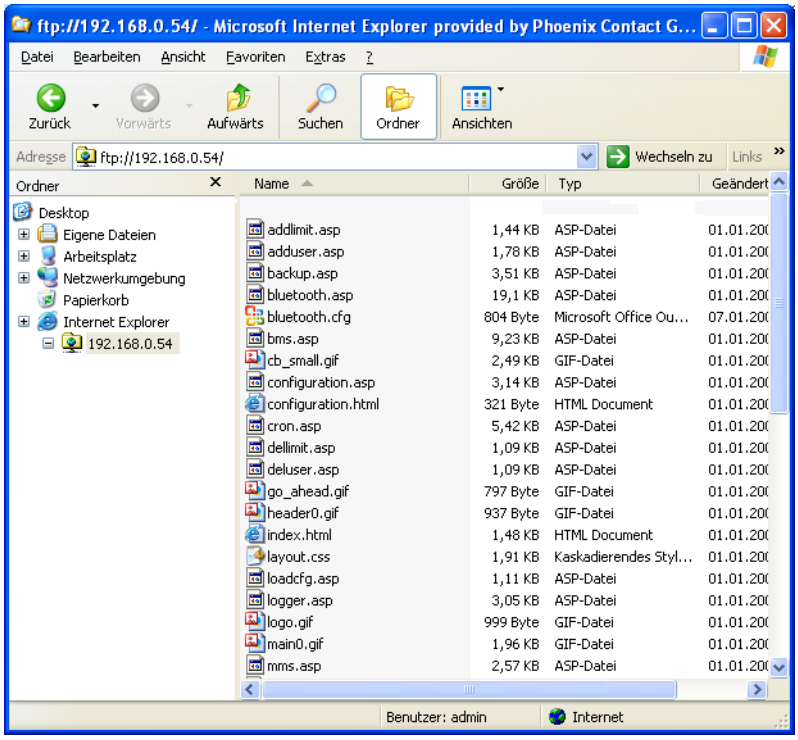

ftp://192.168.0.54/ - Microsoft Internet Explorer provided by Phoenix Contact G...
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Vorwärts Aufwärts Suchen Ordner Ansichten
Adresse ftp://192.168.0.54/
Wechseln zu Links
Ordner
Desktop
Eigene Dateien
Arbeitsplatz
Netzwerkumgebung
Papierkorb
Internet Explorer
192.168.0.54
Name Größe Typ Geändert
addlimit.asp 1,44 KB ASP-Datei 01.01.20(
adduser.asp 1,78 KB ASP-Datei 01.01.20(
backup.asp 3,51 KB ASP-Datei 01.01.20(
bluetooth.asp 19,1 KB ASP-Datei 01.01.20(
bluetooth.cfg 804 Byte Microsoft Office Ou... 07.01.20(
bms.asp 9,23 KB ASP-Datei 01.01.20(
cb_small.gif 2,49 KB GIF-Datei 01.01.20(
configuration.asp 3,14 KB ASP-Datei 01.01.20(
configuration.html 321 Byte HTML Document 01.01.20(
cron.asp 5,42 KB ASP-Datei 01.01.20(
dellimit.asp 1,09 KB ASP-Datei 01.01.20(
deluser.asp 1,09 KB ASP-Datei 01.01.20(
go_ahead.gif 797 Byte GIF-Datei 01.01.20(
header0.gif 937 Byte GIF-Datei 01.01.20(
index.html 1,48 KB HTML Document 01.01.20(
layout.css 1,91 KB Kaskadierendes Styl... 01.01.20(
loadcfg.asp 1,11 KB ASP-Datei 01.01.20(
logger.asp 3,05 KB ASP-Datei 01.01.20(
logo.gif 999 Byte GIF-Datei 01.01.20(
main0.gif 1,96 KB GIF-Datei 01.01.20(
mms.asp 2,57 KB ASP-Datei 01.01.20(
Benutzer: admin
Internet

Figure 3-27 FTP view of the BTAP under Windows XP

A Readme file is provided with the firmware, which describes in detail how to proceed.

First read the Readme file and follow the instructions.

3.6 Configuration Examples

3.6.1 Manually Configured Multi-Point Solution (Wireless Switch)

Aim: Using a BTAP that is connected to an Ethernet network (LAN) via a copper connection, up to seven Bluetooth clients can access the LAN via Bluetooth.

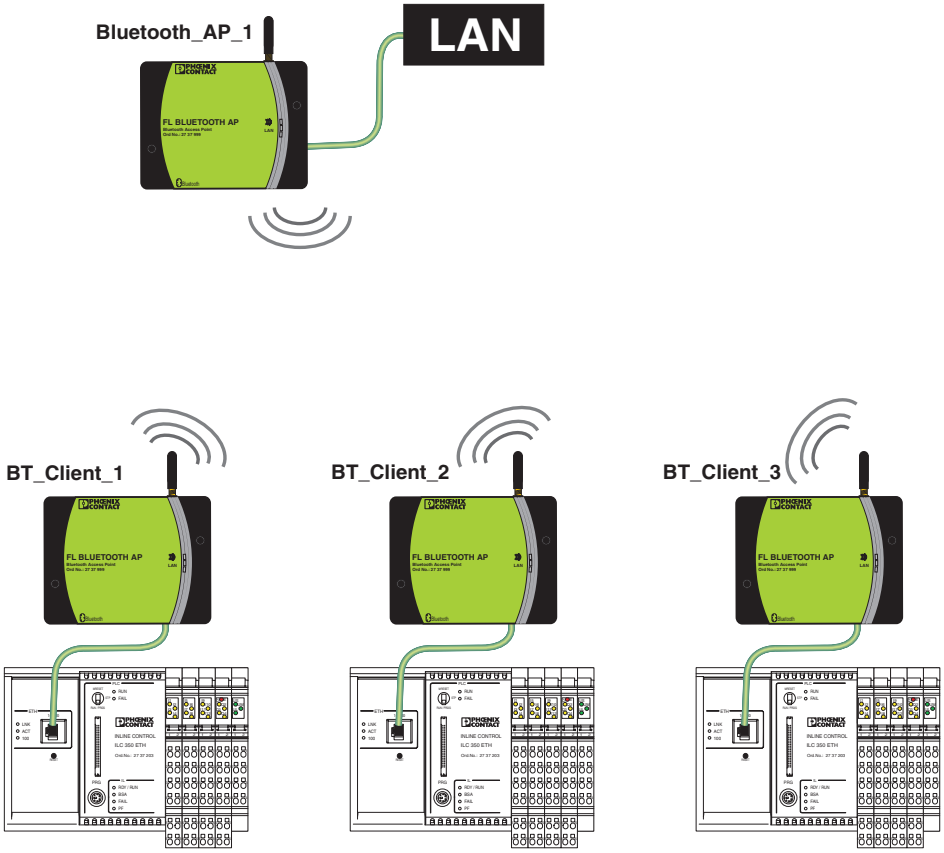


Figure 3-28 Example configuration for a multi-point solution

Configuration:

The BTAP, which is used as the access point for the wireless network, should provide access for clients with IP address "10.0.0.200" and local name "Bluetooth_AP_1".

The clients should be assigned IP address "10.0.0.201" and local name "BT_Client_1", and so on.

3.6.1.1 Procedure

Network Settings for the Access Point

Start up the **access point** and start WBM. On the "Network" web page, enter the following IP address under "Ethernet/Ip": 10.0.0.200

Save the settings with "Save".

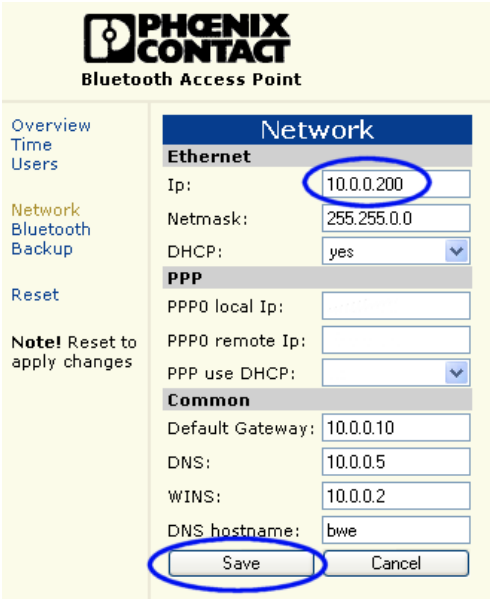


Figure 3-29 IP address used in the example

Bluetooth Settings

Switch to the "Bluetooth" web page.

Under "General/Local Name", enter the desired name (Bluetooth_AP_1 in the example).

Make sure that the access point and clients have different "Local Names", otherwise the clients may connect to one another.

It is recommended that the security function is switched on (Security mode: "on"). When the security function is switched on, the passkey (default: 32825) **must** be the **same** on all devices that are to communicate with one another.

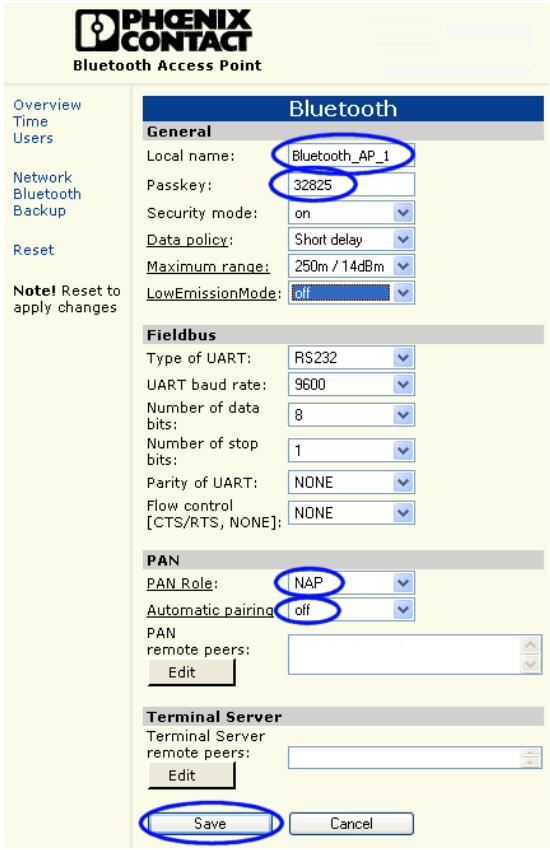


Figure 3-30 Bluetooth settings used in the example

Under "PAN/PAN Role", select "NAP" (Network Access Point).

Save the settings with "Save" and restart the device.

All settings must be saved with "Save" and activated with a device restart.

Network Settings for the Client (Example for a Client)

Start up the **client** and start WBM. On the "Network" web page, enter the following IP address under "Ethernet/Ip": 10.0.0.201

Save the settings with "Save".

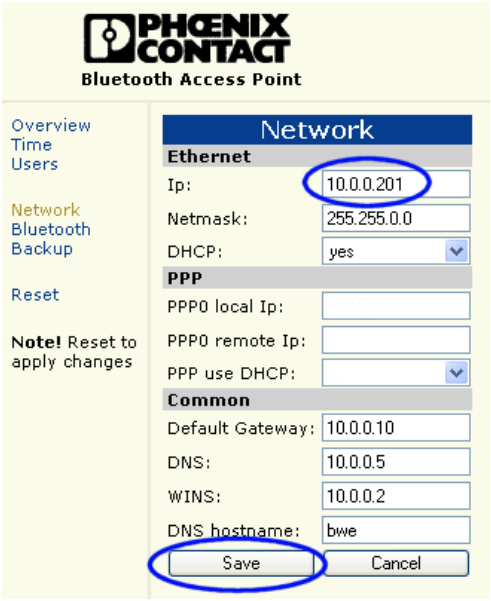


Figure 3-31 IP address used in the example

Bluetooth Settings

Switch to the "Bluetooth" web page.

Under "General/Local Name", enter the desired name (BT_Client_1 in the example).

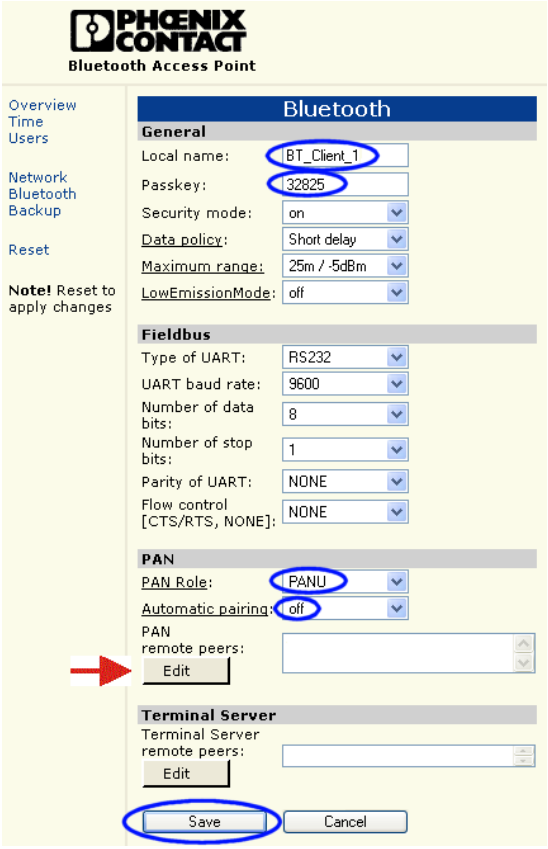


Figure 3-32 Bluetooth settings used in the example

Under "PAN/PAN Role", select "PANU" (Personal Area Network User).

Under "PAN", click on "Edit" (red arrow in Figure 3-32).

Under "PAN Add Device", click on "Search for Devices" (red arrow in Figure 3-33).

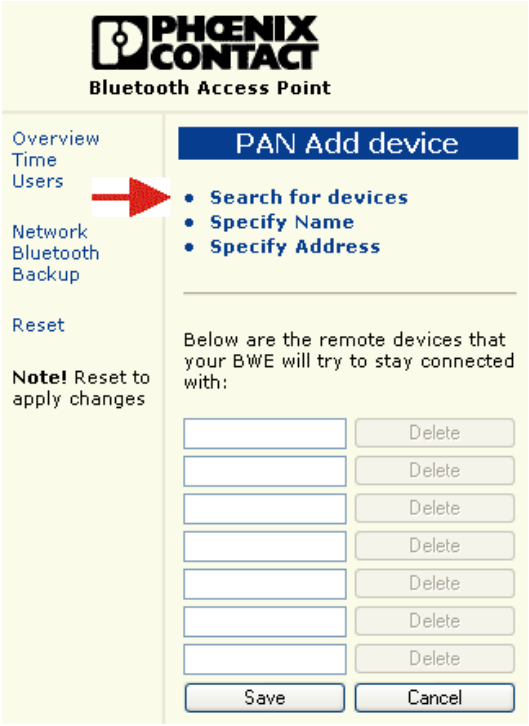


Figure 3-33 Searching for additional Bluetooth devices

All available Bluetooth devices are now displayed with their "Local Name" and MAC address. Select the desired device(s) by activating the checkbox and saving with "Save". After saving, the selected device appears in the list in Figure 3-33.

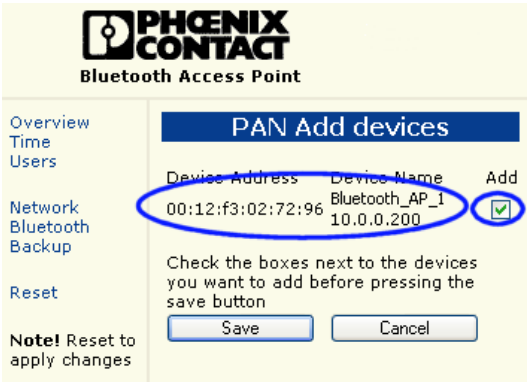


Figure 3-34 Display of Bluetooth devices that can be accessed

Save the settings with "Save" and restart the device. When the BT client is restarted, it connects automatically to the "Bluetooth_AP_1" access point.

3.6.2 Roaming for a Mobile Client Using Two Access Points

Aim: A mobile client is to permanently remain in contact with a controller along its radius of movement using one of two access points. The radius of movement for the client is greater than the radio field coverage of one access point. See example illustration.

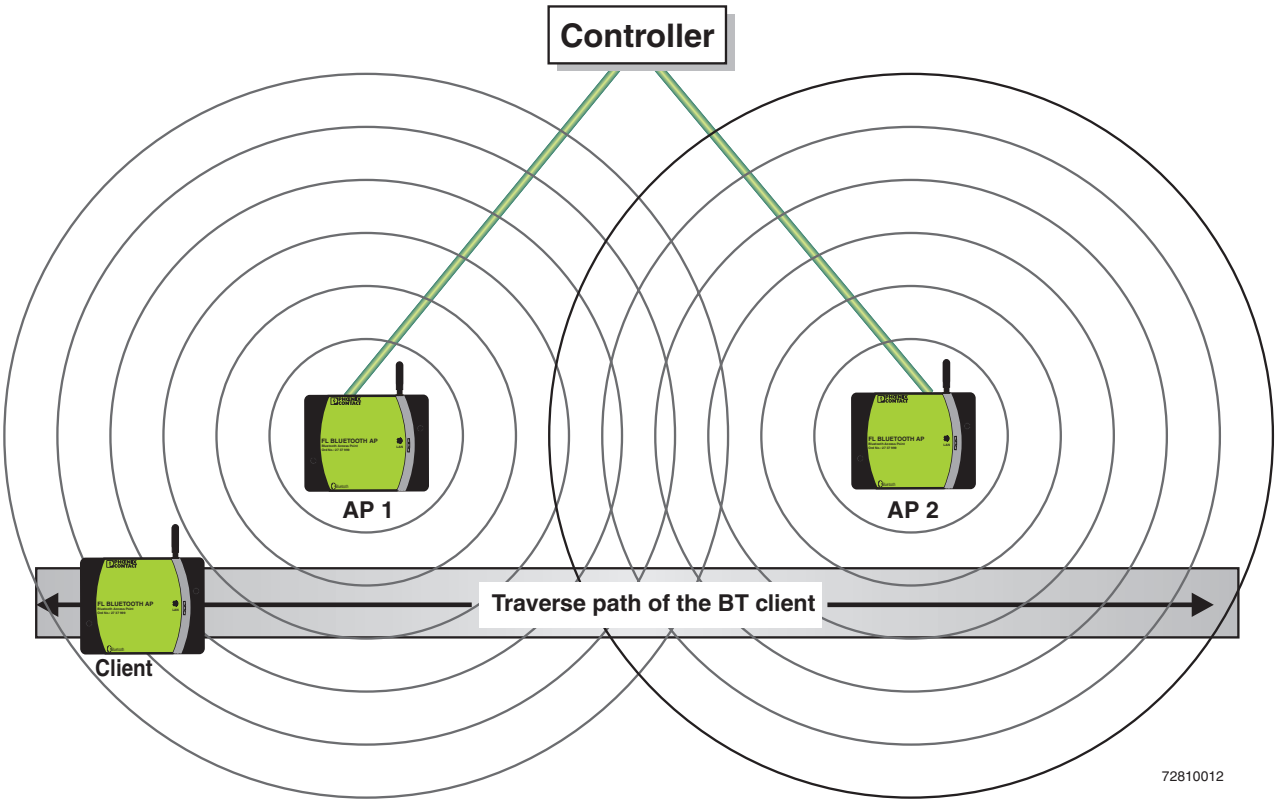


Figure 3-35 Example illustration for roaming

If an **Ethernet switch** is used to connect the access point to the controller, **in the worst case scenario** after the client connection switches from one access point to the other, **the controller cannot communicate with the client for the duration of the aging time of the switch**. Make sure that the application connected to the client communicates with the controller in the required time-slot pattern, in order to inform the switch of the port change and to ensure the connection.

Configuration:

Both BTAPs, which are used as access points for the mobile client, should enable permanent access for the client with IP address "10.0.0.100" and "10.0.0.200" and local name "AP 1" and "AP 2".

The clients should be assigned IP address "10.0.0.150" and local name "Mobiler_Client", and so on.

3.6.2.1 Procedure

Network Settings for the Access Points

Start up the **access point** and start WBM. On the "Network" web page, enter the following IP address under "Ethernet/Ip": 10.0.0.200

Save the settings with "Save".

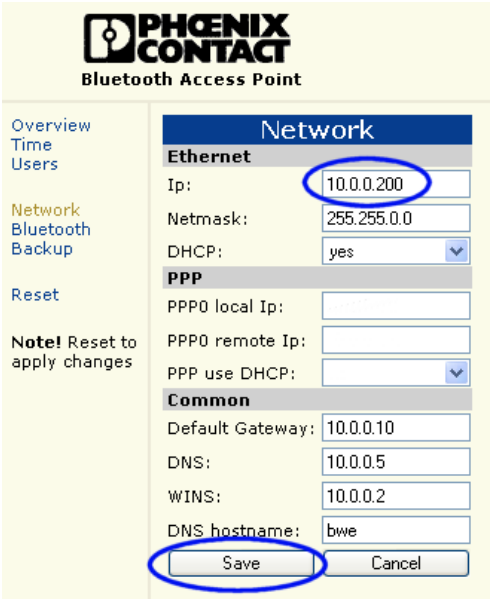


Figure 3-36 IP address used in the example

Bluetooth Settings

Switch to the "Bluetooth" web page.

Under "General/Local Name", enter the desired name (AP_2 in the example).

It is recommended that the security function is switched on (Security mode: "on"). When the security function is switched on, the passkey (default: 32825) **must** be the **same** on all devices that are to communicate with one another.

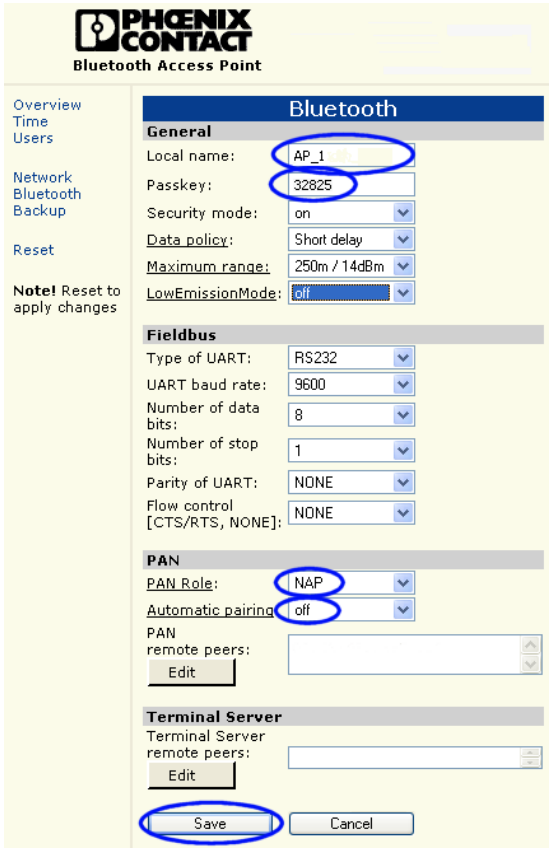


Figure 3-37 Bluetooth settings used in the example

Under "PAN/PAN Role", select "NAP" (Network Access Point).

Save the settings with "Save" and restart the device. Now set the configuration on the second access point.

All settings must be saved with "Save" and activated with a device restart.

Network Settings for the Mobile Client

Start up the **client** and start WBM. On the "Network" web page, enter the following IP address under "Ethernet/Ip": 10.0.0.150

Save the settings with "Save".

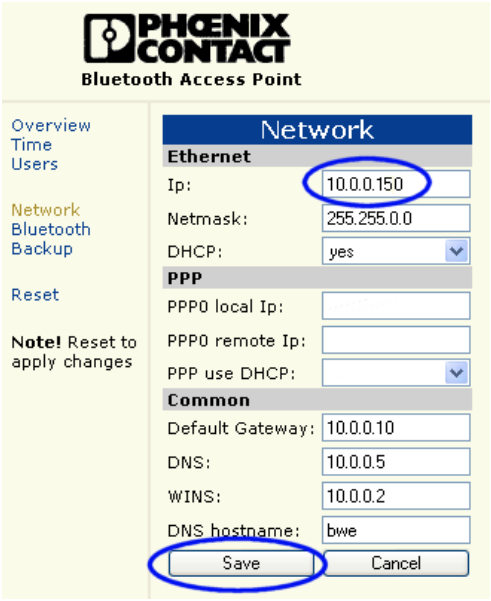


Figure 3-38 IP address used in the example

Bluetooth Settings

Switch to the "Bluetooth" web page.

Under "General/Local Name", enter the desired name (Mobiler_Client in the example).

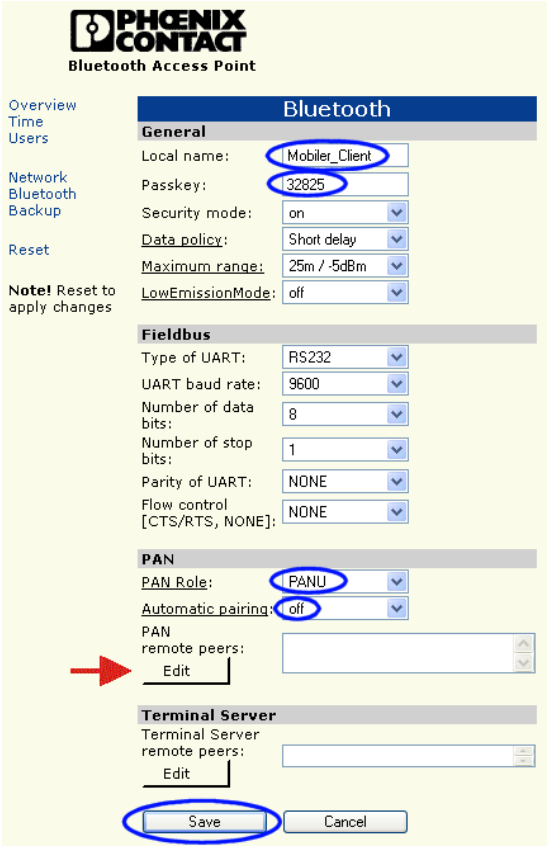


Figure 3-39 Bluetooth settings used in the example

Under "PAN/PAN Role", select "PANU" (Personal Area Network User).

Under "PAN", click on "Edit" (red arrow in Figure 3-39).

Under "PAN Add Device", click on "Search for Devices" (red arrow in Figure 3-40).

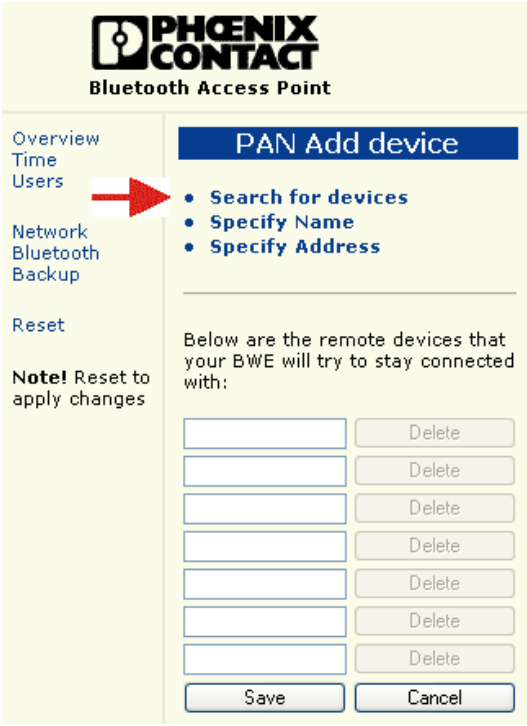


Figure 3-40 Searching for additional Bluetooth devices

All available Bluetooth devices are now displayed with their "Local Name" and MAC address. Select both desired devices by activating the checkbox and saving with "Save". After saving, the selected devices appear in the list in Figure 3-40.

Figure 3-41 Display of Bluetooth devices that can be accessed

Save the settings with "Save" and restart the device. When the BT client is restarted, it connects automatically to an access point that can be accessed and only switches to the other access point when the first is no longer available.

All settings must be saved with "Save" and activated with a device restart.

3.6.3 Connect to Name Function

Aim: Using several BTAPs that are configured as access points, mobile clients are to access an Ethernet network (LAN) without each client requiring knowledge of each access point.

Configuration:

The BTAPs, which are used as access points for the wireless network, should provide access for clients with IP addresses "10.0.0.201", "10.0.0202" and local name "Phoenix_AP_1".

The clients should be assigned IP address "10.0.0.101" and local name "BT_Client_1", and so on.

3.6.3.1 Procedure

Network Settings for the Access Point

Start up the **access point** and start WBM. On the "Network" web page, enter the following IP address under "Ethernet/Ip": 10.0.0.200

Save the settings with "Save".

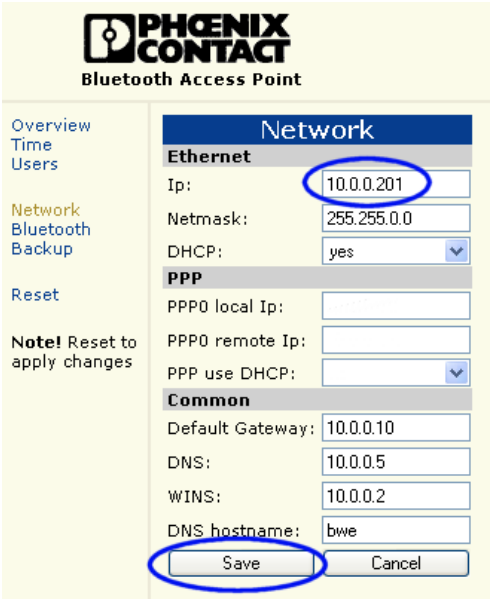


Figure 3-42 IP address used in the example

Bluetooth Settings

Switch to the "Bluetooth" web page.

Under "General/Local Name", enter the desired name (Phoenix_AP_1 in the example).

When using the Connect to Name function, the "Local Names" of the access points must have the same character strings at the start and only differ with regard to the last character. Example: "**Phoenix_AP**_1", "**Phoenix_AP**_2", "**Phoenix_AP**...".

Make sure that the access point and clients have different "Local Names", otherwise the clients may connect to one another.

It is recommended that the security function is switched on (Security mode: "on"). When the security function is switched on, the passkey (default: 32825) **must** be the **same** on all devices that are to communicate with one another.

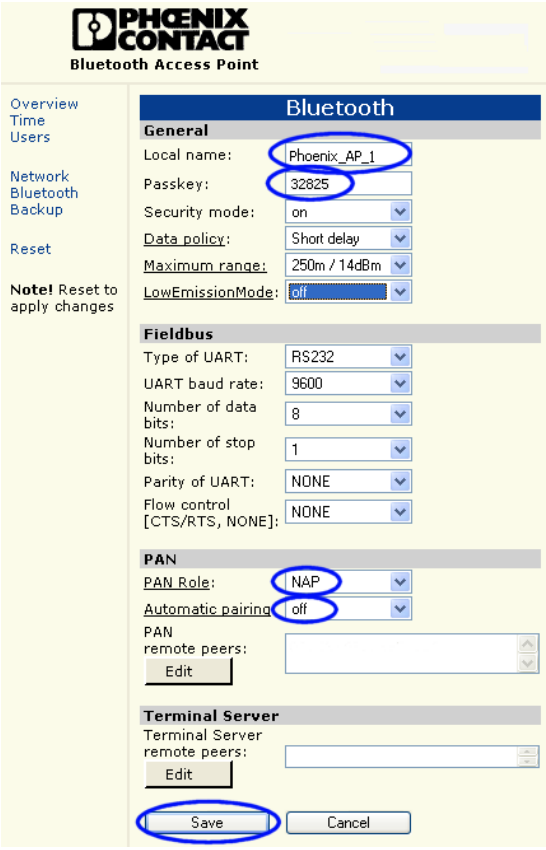


Figure 3-43 Bluetooth settings used in the example

Under "PAN/PAN Role", select "NAP" (Network Access Point).

Save the settings with "Save" and restart the device.

All settings must be saved with "Save" and activated with a device restart.

Network Settings for the Client (Example for a Client)

Start up the **client** and start WBM. On the "Network" web page, enter the following IP address under "Ethernet/Ip": 10.0.0.101

Save the settings with "Save".

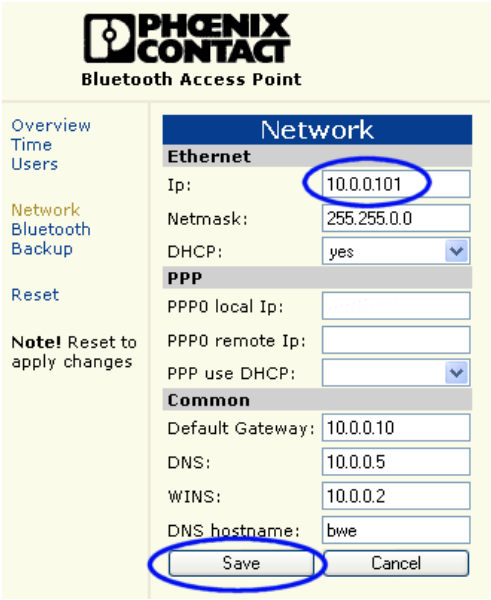


Figure 3-44 IP address used in the example

Bluetooth Settings

Switch to the "Bluetooth" web page.

Under "General/Local Name", enter the desired name (BT_Client_1 in the example).

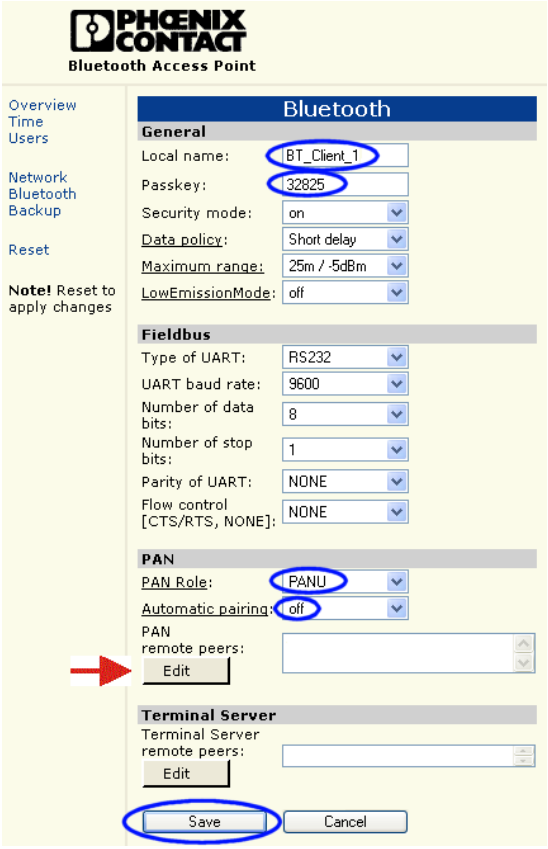


Figure 3-45 Bluetooth settings used in the example

Under "PAN/PAN Role", select "PANU" (Personal Area Network User).

Under "PAN", click on "Edit" (red arrow in Figure 3-32).

In the blank fields of the same area, enter the "Local Names" of the access points (red arrow in Figure 3-46). "**Phoenix_AP**" in the example.

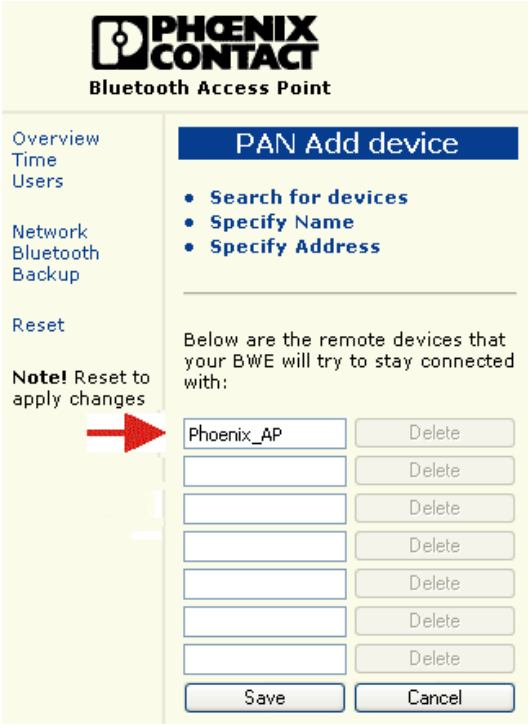


Figure 3-46 Entering the Bluetooth access points

The client can now log into any access point whose "Local Name" starts with "Phoenix_AP". Save the settings with "Save" and restart the device. When the BT client is restarted, it connects automatically to the "Bluetooth_APxxx" access point.

3.6.4 Terminal Server Function

COM Port Redirector Software:

Serial device 1

- Select virtual COM port: COM 3
- Terminal server IP address: 10.0.0.10
- Terminal server port: 1200
- Data transmission mode (if it can be set): Raw data

Serial device 2

- Select virtual COM port: COM 4
- Terminal server IP address: 10.0.0.10
- Terminal server port: 1201
- Data transmission mode (if it can be set): Raw data
-

Data that is sent to COM 3 on the PC arrives at the D-SUB female connector of the PSI device with the Bluetooth name "Serial Device 1"; for COM 4 this is "Serial Device 2". It is assigned via the port number, which is entered under "Terminal Server Remote Peers" in the COM port redirector software.

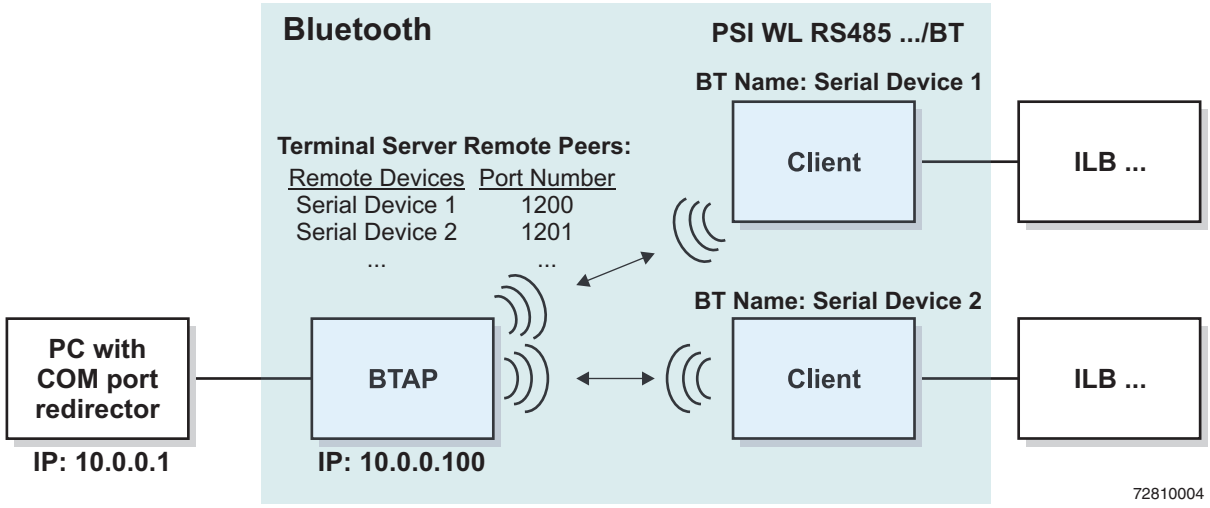


Figure 3-47 "Terminal Server" configuration example

4 Basics, Antenna Accessories, and Calculation Example for a Radio Path

4.1 Wireless Technology Basics

Wireless technology is based on the propagation and receipt of electromagnetic waves. These waves are not subject to wear of any kind, but respond in very different ways in terms of propagation, dispersion, and reflection depending on their frequency. The propagation of waves in an area is three dimensional and occurs at different strengths.

Numerous factors affect this propagation, however none of these factors can affect the propagation to the extent that a signal is not safely detected at the receiver.

4.1.1 Wave Dispersion

Every electromagnetic wave has different dispersion properties depending on its frequency. A simple comparison can be made between the wave dispersion in the 2.4 GHz ISM range and wave dispersion for visible light.

Every material has a frequency-dependent attenuation, every surface material bends, reflects, refracts, absorbs or disperses electromagnetic waves of any kind. This means that every obstacle between the transmitter and receiver must be taken into account for data transmission.

Transmission through the medium of air also attenuates the radio signal and is known as free space attenuation. Free space attenuation can be calculated using the following formula:

Free space attenuation = 32.4 + 20 x log (frequency in MHz) + 20 x log (distance in km)

For simple calculations in the 2.4 GHz band, the expression "32.4 + 20 x log 2400 MHz" can be replaced by the constant value "100".

This results in the following simplified formula:

Free space attenuation = 100 + 20 x log (distance in km)

4.1.2 Assembling the BTAP in a Control Cabinet

If the BTAP is assembled in a control cabinet, the antenna must be led outside. For a list of possible applications and corresponding accessories, please refer to "Antenna Accessories" on page 4-3. For additional antenna accessories, please refer to "Accessories" 5.1.2 on page 5-3.

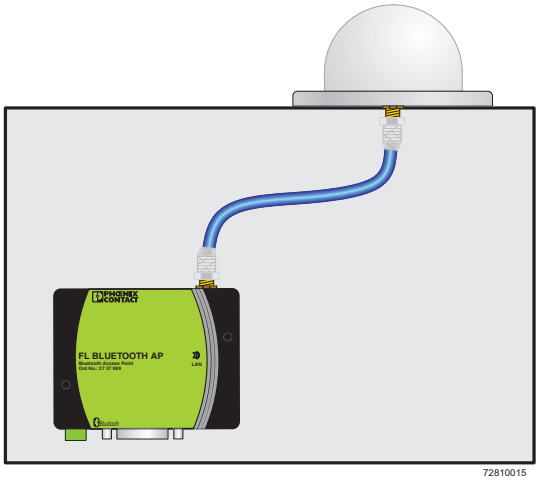


Figure 4-1 Installation example in a control cabinet/box with 3 dBi vandalism-proof antenna

Assembly in a Control Cabinet/Box

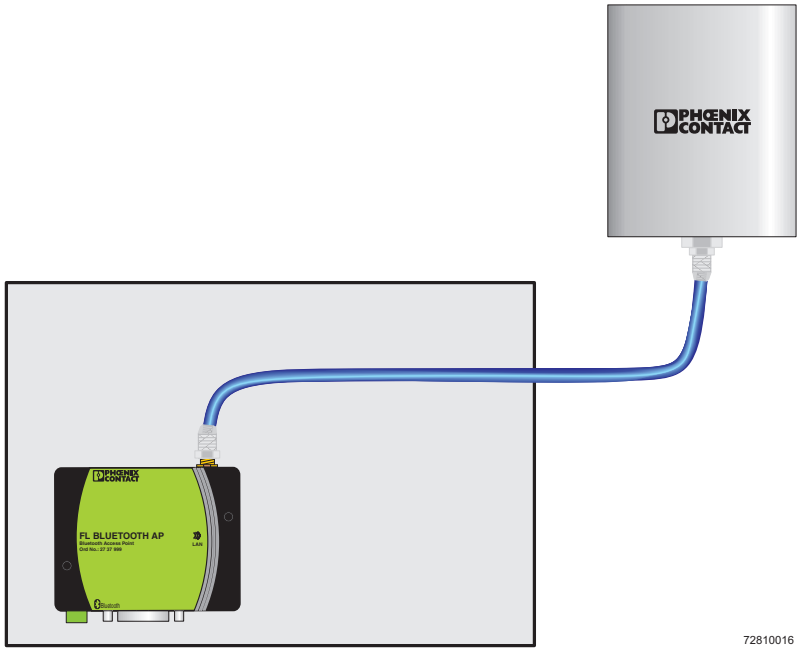


Figure 4-2 Installation example in a control cabinet/box with 8 dBi panel antenna

4.1.3 Antenna Accessories

Some applications require the use of special antennas, for example, to improve the quality of a radio path or increase its range.

Example - Control Cabinet Assembly:

If the BTAP is assembled in a control cabinet, the antenna must be led outside as the radio waves are shielded by the metal of the cabinet.

The table below illustrates the accessories suitable for a few example applications.

Example - Creation of a Radio Path:

Panel antennas, which are connected to the BTAP via antenna cables, are particularly suitable for point-to-point connections over longer distances.

The use of an antenna with 6 dBi gain doubles the range (under appropriate conditions).

The table below illustrates the accessories suitable for a few example applications.

Table 4-1 Selection of antennas and accessories

Application	Accessory Required	Antenna Type Used
Antenna on the device (default upon delivery)		Omni-directional antenna, 0 dBi (supplied as standard)
Omni-directional antenna with 0.5 m cable – Emits in all directions – Mounting, e.g., on control cabinet	0.5 m pigtail: RAD-PIG-EF316-SMA-SMA (Order No. 2885618) Adapter: RAD-ADP-SMA/F-SMA/F (Order No. 2884541)	Omni-directional antenna, 0 dBi (supplied as standard)
Omni-directional antenna with 1.5 m cable, well protected – Easy mounting, e.g., on control cabinet – Emits in all directions		Vandalism-proof antenna, 3 dBi, including cable, RAD-ISM-2400-ANT-VAN-3-0-SMA (Order No. 2885867)
Panel antenna with 3 m or 5 m cable for indoor installation – Away from the control cabinet – Point-to-point connection of fixed units – Longer ranges	3 m antenna cable: RAD-CAB-EF-142-3M (Order No. 2884512) 5 m antenna cable: RAD-CAB-EF-142-5M (Order No. 2884525)	8 dBi panel antenna, RAD-ISM-2400-ANT-PAN-8-0 (Order No. 2867610)

Additional antennas and application scenarios available on request.

Make sure that the permissible transmission power for your country is not exceeded.

See "Approvals for Countries" on page 1-3 and "Setting the Transmission Power" on page 3-20.

4.1.4 Example Calculation for a Transceiver System

All attenuations and all gains along a transceiver path must be taken into account when calculating the radio path. The transmission properties for the relevant frequency range must be known for all components.

For example, for a path in the 2.4 GHz ISM band, all values are added together (gains with positive sign, attenuations with negative sign):

Transmission power	P = 25.1 mW	+14.0	dBm
Transmitter cable	3 m cable	-2.9	dB
	2 connectors	-0.4	dB
Transmitting antenna	Panel antenna	+8.0	dBi
Free space attenuation	Optimum line of sight 100 m	-80.0	dB
Receiving antenna	Panel antenna	+8.0	dBi
Receiver cable	3 m cable	-2.9	dB
	2 connectors	-0.4	dB
Receiver sensitivity	-85 dBm (must be viewed as positive)	+85.0	dBm
Final total	**System reserve**	**+28.4**	**dB**

For a stable wireless connection, the system reserve must be at least 10 dB.

4.1.5 Calculation for the Emitted Power

The country-specific, approved, emitted power (see "Approvals for Countries" on page 1-3) must not be exceeded. This should be checked in particular when using gain antennas.

Example for Germany

Permissible emitted power: 20 dBm, maximum

Set transmission power (see "Setting the Transmission Power" on page 3-20)	**+14 dBm**
Antenna cable (attenuation)	**-4 dB**
Panel antenna (gain)	**+8 dBi**
Emitted power (total)	**18 dBm**

The device can be operated in Germany with this setting as the value is below 20 dBm. If the device were to be operated in Italy, for example, the transmission power would have to be set to a lower power level, e.g., 6 dBm, so as not to exceed the overall maximum permitted value of 10 dBm.

5 Technical Data

General Data	
Function	Bluetooth access point
Housing dimensions (width x height x depth) in mm	80 x 25 x 65
Permissible operating temperature	-30°C to +85°C
Permissible storage temperature	-40°C to +85°C
Degree of protection	IP20, DIN 40050, IEC 60529
Protection class	Class 3 VDE 0106; IEC 60536
Humidity	
Operation	5% to 90%, no condensation
Storage	10% to 95%, no condensation
Air pressure	
Operation	79.5 kPa to 108 kPa, 2000 m above sea level
Storage	70 kPa to 108 kPa, 3000 m above sea level
Mounting position	Vertically on a flat mounting surface
Connection to protective earth ground	Not required
Weight	95 g, typical

Supply Voltage (US1/US2 Redundant)	
Connection	Via COMBICON; conductor cross section = 2.5 mm^2, maximum
Nominal value	24 V DC (SELV)
Permissible voltage ranges	9 V DC to 30 V DC
Typical current consumption on US at 24 V DC	200 mA
Typical power consumption	5 W

Interfaces	
Number of Ethernet ports	1
Connection format	8-pos. RJ45 female connector on the access point
Connection medium	Twisted pair cable with a conductor cross section of 0.14 mm^2 to 0.22 mm^2
Cable impedance	100 Ohm
Transmission speed	10/100 Mbps, auto negotiation
Maximum network segment expansion	100 m
Default IP address	10.0.0.100, DHCP client activated by default upon delivery
Bluetooth interface	
Version	Bluetooth 2.4 GHz up to 1 Mbps
Transmission power	14 dBm, maximum - automatically controlled or can be adjusted manually
Receiver sensitivity	-85 dBm
Radio modules that can be connected	7 in preparation
Supported profiles	LAP, PAN, SPP
Bluetooth antenna	
Characteristic	Omni-directional antenna (can be replaced)
Gain	0 dBi

Interfaces (Continued)

Connection	SMA
Bluetooth functions	
Operating mode	Access point, Ethernet client adapter (COM server)
Function	Bridge, P2P, MP, COM server
Configuration	Via web-based management
Security	128-bit data encryption

Mechanical Tests

Shock test according to IEC 60068-2-27	Operation: 25g, 11 ms period, half-sine shock pulse Storage/transport: 50g, 11 ms period, half-sine shock pulse
Vibration resistance according to IEC 60068-2-6	Operation/storage/transport: 5g, 10 - 150 Hz, Criterion 3
Free fall according to IEC 60068-2-32	1 m

Approvals

FCC/CFR 47 Part 15, ETS 300 328

Conformance With EMC Directives

Noise emission according to EN 55022	Class B
Radio interference field strengths according to EN 55022	Class A
Electrostatic discharge (ESD) according to EN 61000-4-2	Contact discharge: ±4 kV Air discharge: ±8 kV
Electromagnetic fields according to IEC 61000-4-3	10 V/m; Criterion A
Conducted interference according to IEC 61000-4-6	10 V_{RMS}; Criterion A
Fast transients (burst) according to IEC 61000-4-4	Data lines: 1 kV; Criterion B Power supply lines: 0.5 kV; Criterion B
Surge voltages according to IEC 61000-4-5	Data lines: ±1 kV asymmetrical; Criterion B Power supply lines: ±0.5 kV symmetrical/asymmetrical; Criterion B

Differences Between This Version and Previous Versions

Version 00: First version

5.1 Ordering Data

5.1.1 Products

Description	Order Designation	Order No.	Pcs./Pck.
Bluetooth access point	FL BLUETOOTH AP	2737999	1

5.1.2 Accessories

Description		Order Designation	Order No.	Pcs./Pck.
Antenna with omni-directional characteristics and wrap Antenna connection Gain Degree of protection Impedance Horizontal emission angle Vertical emission angle	 ∅ 40 to 60 mm N female connector 9 dBi IP65 50 Ω 360° 15°	RAD-ISM-2400-ANT-OMNI-9-0	2867623	1
Panel antenna with directional characteristics and wrap Antenna connection Gain Degree of protection Dimensions (W x H x D)	 ∅ 40 to 60 mm SMA 8 dBi IP55 101 x 80 x 20 mm	RAD-ISM-2400-ANT-PAN-8-0	2867610	1
Antenna with omni-directional characteristics and protection against vandalism Antenna connection Gain Degree of protection Impedance Length of the connecting cable	 SMA connector 3 dBi IP55 50 Ω 1.5 m	RAD-ISM-2400-ANT-VAN-3-0-SMA	2885867	1
Mounting bracket for wall mounting the omni-directional antenna with protection against vandalism		RAD-ANT-VAN-MKT	2885870	1
Coaxial antenna cable Connection Attenuation Impedance	1 m MCX/SMA 2 dBi 50 Ω	RAD-PIG-EF316-MCX-SMA	2867678	1
Coaxial antenna cable Connection Attenuation Impedance	0.3 m N female connector/SMA 1.5 dBi 50 Ω	RAD-PIG-EF316-N-SMA	2867694	1
Adapter N (female) > N (female)		RAD-ADP-N/F-N/F	2867843	1
Adapter SMA (female) > SMA (female)		RAD-ADP-SMA/F-SMA/F	2884541	1
Adapter RSMA (female) > RSMA (female)		RAD-ADP-RSMA/F-RSMA/F	2884538	1
Surge protection - Total surge current (8/20) µs of 20 kA, insertion attenuation at 2.4 GHz to 2.5 GHz < 0.3 dB, N female connector/ N female connector		CN-UB-280DC-BB	2818850	1
Surge protection - Total surge current (8/20) µs of 20 kA, insertion attenuation at 2.4 GHz to 2.5 GHz < 0.3 dB, N male connector/N female connector		CN-UB-280DC-SB	2818148	1
Sealing tape - Vulcanizing to protect adapters, splitters or cable connection, watertight		RAD-TAPE-SV-25-10	2885812	1
Antenna cable				
3 m antenna cable, SMA (male) > SMA (male)		RAD-CAB-EF142-3M	2884512	1

Description	Order Designation	Order No.	Pcs./Pck.
5 m antenna cable, SMA (male) > SMA (male)	RAD-CAB-EF142-5M	2884525	1
3 m antenna cable, N (male) > N (male)	RAD-CAB-EF393-3M	2867649	1
5 m antenna cable, N (male) > N (male)	RAD-CAB-EF393-5M	2867652	1
10 m antenna cable, N (male) > N (male)	RAD-CAB-EF393-10M	2867665	1
15 m antenna cable, N (male) > N (male)	RAD-CAB-EF393-15M	2885634	1
Pigtail			
1 m pigtail, MCX (male) > SMA (male)	RAD-PIG-EF-316-MCX-SMA	2867678	1
0.5 m pigtail, MCX (male) > N (male)	RAD-PIG-EF-316-MCX-N	2867681	1
0.3 m pigtail, N (female) > SMA (male)	RAD-PIG-EF316-N-SMA	2867694	1
0.5 m pigtail, N (female) > N (male)	RAD-PIG-EF316-N-N	2867704	1
0.5 m pigtail, SMA (male) > SMA (male)	RAD-PIG-EF316-SMA-SMA	2885618	1
Gray RJ45 connector set for linear cable	FL PLUG RJ45 GR/2	2744856	2
Green RJ45 connector set for crossed cable	FL PLUG RJ45 GN/2	2744571	2
Assembly tool for RJ45 connector	FL CRIMPTOOL	2744869	1
Patchbox 8 x RJ45 CAT 5e pre-assembled, can be retrofitted	FL PBX 8TX	2832496	1
Patchbox 6 x RJ45 CAT 5e and 4 SC-RJ, glass pre-assembled, can be retrofitted	FL PBX 6TX/4FX	2832506	1
Patch cable			
Patch cable, CAT 5, pre-assembled, 0.3 m long	FL CAT5 PATCH 0,3	2832250	10
Patch cable, CAT 5, pre-assembled, 0.5 m long	FL CAT5 PATCH 0,5	2832263	10
Patch cable, CAT 5, pre-assembled, 1.0 m long	FL CAT5 PATCH 1,0	2832276	10
Patch cable, CAT 5, pre-assembled, 1.5 m long	FL CAT5 PATCH 1,5	2832221	10
Patch cable, CAT 5, pre-assembled, 2.0 m long	FL CAT5 PATCH 2,0	2832289	10
Patch cable, CAT 5, pre-assembled, 3.0 m long	FL CAT5 PATCH 3,0	2832292	10
Patch cable, CAT 5, pre-assembled, 5.0 m long	FL CAT5 PATCH 5,0	2832580	10
Patch cable, CAT 5, pre-assembled, 7.5 m long	FL CAT5 PATCH 7,5	2832616	10
Patch cable, CAT 5, pre-assembled, 10.0 m long	FL CAT5 PATCH 10	2832629	10

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